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ABSTRACT

This resource unit, an addendum to The Exploratory Computer Literacy Curriculum Guide, Grades 9-12, is designed to provide teachers with guidelines and classroom computer activities for integrating the exploratory computer literacy program into the curriculum. An overview of the guide is given in the introduction, which notes that the materials reflect the teacher-developers' own environment variables such as school size, student characteristics, accessibility to microcomputers, and teaching style. A section on classroom management offers suggestions for effective curriculum implementation and addresses the operation of the computer laboratory, classroom demonstrations, use of the computers, diskette management, and copyright laws concerning microcomputer software. A broader perspective on implementation within the total school is provided in a section on integrating computer literacy into the curriculum, which addresses such topics as administrative support, a school computer coordinator, schoolwide planning and cooperation, resources, and faculty workshops. Five models are proposed as alternatives for delivering computer literacy in the secondary schools. Sample activities are provided for the language arts, mathematics, science, and social studies, each of which includes course content objectives and guidelines in the following categories: subject, student expectations, instructional mode, prerequisites, classroom management, materials, activity time, teacher preparation, and sequence of activities. Resources include lists of recommended software and additional teaching aids. (DJR)

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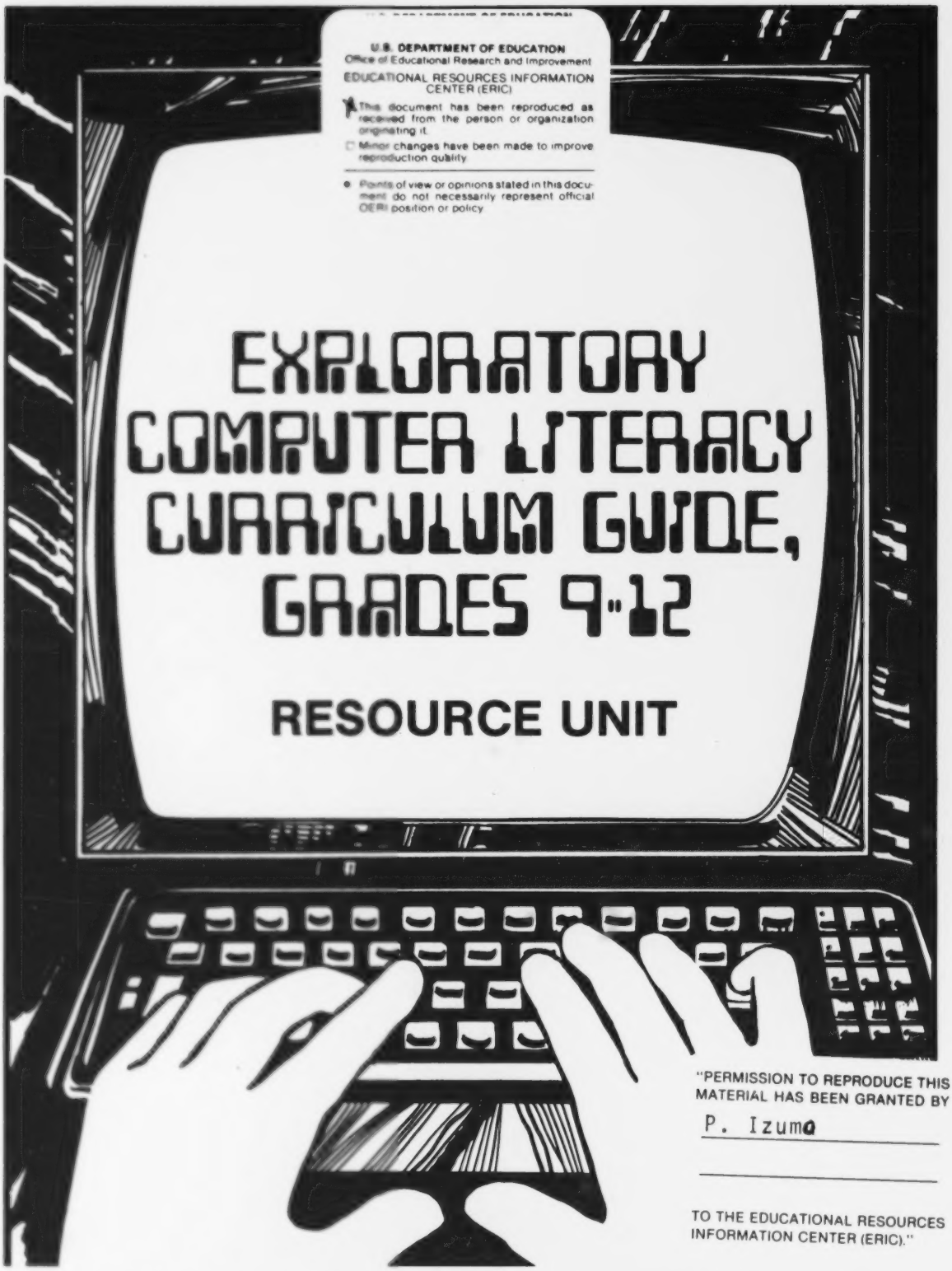
EXPLORATORY COMPUTER LITERACY CURRICULUM GUIDE, GRADES 9-12

RESOURCE UNIT



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FOREWORD

This Resource Unit is designed to provide teachers using the Exploratory Computer Literacy Curriculum Guide, Grades 9-12, with additional classroom computer activities for integrating the exploratory computer literacy program into the curriculum. These activities were developed by local teachers in the areas of language arts, mathematics, science and social studies. As with the earlier sample activities found in the guide, these instructional units are only "starting points" from which teachers can expand into their own approaches, using their own ideas and creativity.

We hope that all high school teachers and principals will find this resource useful in implementing exploratory computer literacy programs in their classrooms and schools.

Francis M. Hatanaka, Superintendent

ACKNOWLEDGMENT

The Resource Unit, an addendum to the Exploratory Computer Literacy Curriculum Guide, Grades 9-12, is a composite of contributions from four secondary teachers who have developed the activities to meet the needs of their particular subject area and student enrollment. In addition, ideas for some activities have been incorporated into the addendum from specific resources; appropriate credit has been given. The teacher contributors are:

Iris Inouye	Honolulu District Office
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INTRODUCTION

As schools develop plans and programs to meet the challenge of providing computer experiences for their students, teachers and principals have requested the sharing of implementation strategies and available resources. This resource unit is a continuing effort towards coordinating teacher-developed materials in computer literacy. It should be noted that the paging of the Resource Unit is designated with an 'R' preceding the page number in order to distinguish this unit from the Grades 9-12 Guide.

The materials reflect the teacher-developers' own environments. Variables include size of school, characteristics of student population, accessibility to microcomputers and teaching style. Following the format of the sample activities in the Grades 9-12 Guide, the sample activities in this Resource Unit are intended to provide additional models for what can be done in the subject areas of language arts, mathematics, science and social studies. Teachers and principals using these materials will need to modify the examples to accommodate their own classroom or school situation.

The section on Classroom Management offers suggestions that the teacher-developers of the sample activities have found conducive to effective implementation of exploratory computer literacy. The following section on Integration of Exploratory Computer Literacy into the Curriculum provides a broader perspective on program implementation within the total school setting.

For each of the subject areas of language arts, mathematics, science and social studies four sample activities are provided. Each sample activity includes guidelines for teachers in the following categories:

Subject
Computer Literacy Student Expectations
Instructional Mode
Prerequisites
Classroom Management
Materials
Time for Activity
Teacher Preparation
Sequence of Activities

The suggestions and guidelines describe one way to conduct the activity. Depending on differences in the availability of microcomputers, where they are located in the school, class size, teaching styles and student background, the activity will have to be modified. Each sample activity is intended to serve as a suggestion based on the experiences of the teacher-developer, <u>not</u> as a prescription or formula for all to follow.

A list of software appropriate to the exploratory computer literacy curriculum has been compiled based on recommendations from the teacher-developers and state educational specialists. Specific teaching aids beyond those provided in the guide are also included in this resource unit.

It is expected that teachers using both the guide and this resource unit have received training in the use of computers in education. Minimum training equivalent to Phase II of the Department of Education's inservice training model is assumed. This model for Phase II can be found in the Computers in Instruction: Framework for Administrators, Appendix E, pages I2-16.

Computer Lab

Ideal facilities are a computer lab and an adjoining classroom. Each computer period should begin in the classroom with discussion and directions. The lab should then be used for specific hands-on activities. The secured lab should have a sufficient number of microcomputers to allow two students per machine. However, a ratio of three students per computer is often manageable and may be preferable in some situations where an advanced student tutors beginning users.

Where the teacher has a three per machine ratio, he/she should emphasize the need for teamwork. Students not keyboarding should be actively participating in the lesson and rotated at least once every period. When the teams are expected to identify themselves on paper, they should list the team leader (computer operator for the start of the period's work, sitting in middle position directly in front of the keyboard)...first. The student sitting on the left of the leader can become the reader of manuals and instructions and be listed second. The student on the leader's right can become the secretary and recorder for the team and be listed third. With this arrangement, it is important to stress the need for each team member to assume the duties and responsibilities of each of the three computer positions: Operator/Leader, Reader/Librarian, and Recorder/Secretary. With a fair rotation of positions during the period, each team member should have approximately the same amount of time as computer operator.

General rules for the computer lab must be established before the first day of use. These should include provisions to protect hardware and software, and to maintain class integrity. Hardware protection should preclude foods or liquids in the lab. Science labs that incorporate computers in experiments using liquids must take extra precautions for this arrangement. Software protection should include provisions against borrowing, unauthorized copying and physical damage. When brief lecture periods are required in the lab, it may be necessary to turn off all monitors to get students' attention.

Posters dealing with the care and handling of both hardware and diskettes along with the reference charts for the various software programs can be displayed on bulletin boards within the computer lab. There should be adequate desk space around each microcomputer for students to record screen data or on which to place prepared materials for keyboard entry.

Classroom Demonstrations

Only one computer is required, but at least one large monitor and/or several regular monitors or a video projector will be needed for the classroom environment. Whenever possible, a student should do the actual keyboarding, and the full class should be solicited for input to the program. Teams may be formed for data input or evaluation. Demonstrations are especially appropriate for introductions to and overviews of assignments conducted in the computer lab.

Classroom Computers

If one or more few microcomputers are available in the classroom, sign-up sheets and assigned sessions should be provided to ensure that every student has equal access to the machines. Strict rules for computer use and against computer abuse must be stressed and monitored. Posters listing the rules for computer care and other relevant topics should be displayed where appropriate.

To reduce computer associated noise during class periods, the speaker may be disabled. Printing assignments may be delayed by storing to disk, or printers may be isolated in sound damping containers, which also offer improved security.

During non-instructional periods computers should be available to both students and other staff members. Computer clubs and special interest groups can offer opportunities for both advanced and beginning computer users to develop skills.

Diskette Management

To ease diskette management, an area in the lab or classroom should be set aside for the storage of diskettes. Each computer should be labeled, and the diskettes used should have corresponding labels. A system should be devised for students to go to a designated area in the lab to pick up their student data diskettes as well as the program diskette being used that period. At the end of the period, students should return their diskettes to the designated place. The teacher should be able to see at a glance if all the diskettes have been returned.

Copyright Concerns

Ambiguity in the copyright statutes and their application in educational media have plagued educators for several decades. With the tremendous growth in the use of microcomputers in schools during the 1980s, attention has focused on the copyright law as it pertains to microcomputer software. Unlike some areas affected by the copyright law, microcomputer software copyright protection lacks case law precedent, so interpretation of the law contains many unresolved issues. Even though different sources vary in their interpretation of the copyright law, the vagueness of the law as it applies to microcomputer software and the lack of case law precedent should not be viewed by educators as a loophole to allow unauthorized copying of microcomputer programs.

Currently there are only two permissible instances in making fair use copies of software:

1. That only one backup copy is made from the master copy and that it is created as an essential step in the utilization of the computer program in conjunction with a machine; it cannot be used to program more than one machine at a time; and

2. That such a copy is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

Copies made of copyrighted software for classroom use are currently not legal nor ethical. All DOE employees are expected to adhere to the copyright law.

In attempting to lower costs for educators, publishers are more frequently providing class sets of a software item at a reduced price.

INTEGRATION OF THE EXPLORATORY COMPUTER LITERACY PROGRAM INTO THE CURRICULUM

For effective implementation and successful integration of the Exploratory Computer Literacy Program into the general curriculum, there are several major considerations that must be addressed: administrative support, leadership by a teacher appointed by the principal as the school's computer coordinator or a computer committee established by the principal, school-wide planning and cooperation, resources and faculty workshops. Guidelines to administrators in planning their school efforts for implementing the computer literacy program are provided in the Computers in Instruction: Framework for Administrators guide. Any successful educational program requires the school principal to perceive his/her role as an instructional leader in addition to an administrative leader. This particular program needs his/her support for computers to be integrated into the curriculum.

Another primary consideration is the appointment by the principal of a teacher, interested and capable, as the school's computer coordinator or the establishment by the principal of a school-wide computer committee, which would appoint a committee chairperson. With recommendations from other interested teachers, the computer coordinator/committee needs to establish a plan of action that the school will follow in integrating exploratory computer literacy into the general curriculum. The Task Force on the Delivery of Computer Programs at the Secondary Level proposed five models as alternatives for delivering exploratory computer literacy in the secondary schools. Refer to the Grades 9-12 Guide, the section titled Implementing the Exploratory Computer Literacy Program, pages 13-14. These alternatives should be helpful in determining which method of program delivery is most appropriate for the school.

Of these five models, the first, an elective one-semester course, Computing Applications, is now established in The Foundation Program's Authorized Courses and Code Numbers 1986-1988, pages BB-4 to BB-5.

The second model, a unit within a content area course, can be delivered as a four- to eight-week session through a selected content area, such as Language Arts. With this alternative all students at one or more grade levels can be serviced in one school year. The actual length of the session, the number of students enrolled and the number of microcomputers available in the computer lab would determine which high school grade levels could be serviced in one year. Time constraints, however, limit full exposure to all student expectations in the Exploratory Computer Literacy Program.

On the other hand, attempting the third model, a shared computer lab or resource center among several content area courses, can involve a greater variety of computer applications and cover a wider range of topics in the Exploratory Computer Literacy Program. With two- to three-week sessions offered in Language Arts, Mathematics, Science and Social Studies, all students could be serviced in one or more, but not all, subject areas. However, careful coordination among the departments involved in the program is a critical factor in the success of this model. A master schedule to accommodate the computer needs of these departments must be established

prior to the beginning of the school year by the involved teachers with the assistance of the school's computer coordinator/committee.

The following charts summarize the differences between models #2 and #3 in delivering the Exploratory Computer Literacy Program in the subject areas. They illustrate the contrasts in integrating the program in one versus four subject areas.

Exploratory Computer Literacy	Subject Areas			
Content Areas	Lang.Arts	Math	Science	Soc.Studies
MODEL #2				
History/Evolution of Computing	x			
Computer Operations/Functions	x			
Keyboarding	x			
Computer Tool Applications (Word Processing, Spreadsheets, Databases, Graphing Data)	x			
Computer Impact, Values, Ethics	x			
Computer Careers	x			
MODEL #3				
History/Evolution of Computing			x	
Computer Operations/Functions		x		
Keyboarding/Word Processing	x			
Spreadsheets		x	x	
Databases				x
Simple BASIC Programming		x		
Graphing Data			x	
Computer Impact, Values, Ethics				x
Computer Careers	x			

In integrating the Exploratory Computer Literacy Program, the school's computer coordinator/committee and interested subject area teachers must assess the needs of their courses and determine if and where appropriate computer literacy activities would enhance their curriculum. These same teachers, under the leadership of the school's computer coordinator/committee, should then meet as a group to:

1) identify the delivery strategies to minimize duplication of effort and maximize concept development and reinforcement among teachers, grade levels and subject areas;

2) devise a master schedule and long-range plans for implementation of instruction using computers; and

3) establish rules for computer lab usage.

Another primary concern is the availability and acquisition of resources (hardware, software, funds, facilities), which require both validation by the school's computer coordinator/committee and full administrative support.

The need for school-wide coordination and cooperation in integrating the Exploratory Computer Literacy Program within the curriculum cannot be over-emphasized. The original group of planners should make provisions to conduct faculty workshops for sharing ideas and training others who want to explore instructional computing. As more of the faculty get involved with the program, the planners (and newcomers) can work together in developing plans for an expanded program and further purchases of hardware, software and other teaching materials.

It is the intent of this Resource Unit to provide guidelines and additional sample activities for integrating the Exploratory Computer Literacy Program within the curriculum areas of language arts, mathematics, science and social studies. Such integration is only possible when the activities reinforce both the course content objectives and the student expectations for Exploratory Computer Literacy.

SAMPLE ACTIVITIES

Sample Activities. The suggested sample activities on the following pages support the goals, objectives and student expectations of the Taxonomy, located in the Grades 9-12 Guide, pages 19-21. These activities provide teaching strategies for introducing certain concepts or developing specific skills in exploratory computer literacy. They are not intended to be the only method of presentation but are instead "starting points" from which teachers can expand into their own approaches, using their own ideas and creativity.

Subject. The sample activities have been developed for the subject areas of language arts, mathematics, science and social studies.

Computer Literacy Student Expectations. The computer literacy student expectations listed for each sample activity are written in condensed phrases. For further details, refer to the Grades 9-12 Guide, the Taxonomy of Goals, Objectives and Student Expectations for Exploratory Computer Literacy in the section titled Curriculum Guidelines, pages 17-31. Some of the student expectations will be introduced in the various activities, while others will be reinforced, having been initiated at an earlier grade level. The Scope and Sequence Chart, in the same section as mentioned above, illustrates where, when and how these student expectations are best considered.

Instructional Mode. The major mode or method of instruction is indicated for each activity. Some activities suggest more than one mode. It is at the discretion of the teacher as to what modes seem most appropriate for his or her circumstances. Refer to the discussion on these modes in the Grades 9-12 Guide, the section titled Curriculum Description, pages 11-13.

Prerequisites. Many of the sample activities expect a certain level of experience from the students. In several cases, a reference is made to other activities from either the Grades 9-12 Guide or the Resource Unit.

Classroom Management. The concerns for classroom management, found in the sample activities, include the number of microcomputers available to the teacher and the location of these machines. A microcomputer for classroom demonstration purposes should have a large-screen monitor. With a computer lab setting, if the entire class cannot attend the lab in one session, the teacher many need one or two assistants to either maintain order in the classroom while he or she is in the lab or to help out in the lab while he or she remains in the classroom. Although volunteer help from parents, colleagues or student-teachers is a convenient solution, it may not be all that reliable for any length of time. A more realistic approach would be to train two to three students in each class who are more "computer literate" and willing to take on special responsibilities to help you. Rewards could include bonus points, extra computer time or the additional knowledge and experience gained by this opportunity. Students should prepare their lab exercise on paper before entering the computer lab.

Materials. A number of resources (with specific page numbers) are suggested as possible background reading for the teacher and text material

for students. As the material is geared toward Apple equipment, some adjustments may be needed in the activities for other brands of microcomputers. Materials written for other brands of computers are included in the Teacher References located in the Exploratory Computer Literacy Curriculum Guide, Grades 9-12, pages 169-170.

Time for Activity. Only an approximate time period for each activity can be suggested, since numerous variables, such as number and location of available microcomputers, number of students, range of computer skills among the students, length of classroom period and other classwork assigned, are involved.

Teacher Preparation. Implementing the Exploratory Computer Literacy Guide, Grades 9-12 does require the teacher to plan in advance. Delivery of orders for particular software can take from one to two months. It is important to run through an entire tutorial program or experiment with a tool or utility program, e.g., word processing, prior to any classroom activity. Keeping an eye out for current articles related to computer applications will prove most helpful.

Sequence of Activities. This last category in each sample activity enumerates the actual steps or procedures that a teacher can follow to make the total activity an effective learning experience.

SAMPLE ACTIVITIES
LANGUAGE ARTS

LANGUAGE ARTS COURSE CONTENT OBJECTIVES

Four credits in Language Arts are required for high school graduation. The overall goals of the Secondary Language Arts program are to develop in students the following:

1. The highest degree of informed control over their use of language of which they are capable.

2. Increased understanding of the nature and structure of the English language within a broad perspective of communication.

3. An enriched understanding of literature.

To achieve these goals, five areas of emphasis have been identified: oral communication, reading, writing, language study, and literature. These five areas are basic to helping students develop their oral and written language abilities and respond to the language of others; showing them the enjoyment and power which derive from effective language use; and increasing their ability to think, organize ideas, make decisions, problem solve, and interact in a variety of communication situations. In addition, they contribute to the enlargement of experience, the clarification of values, and the nurturing of the imagination. The instructional approach used at the high school level is to relate the content and skills to the less personal and larger community within which the student lives. Also emphasized is the development of a personal style of language use.

The Minimum Elective Program which provides alternative courses within groupings of courses. For Grades 9-10 courses from the Comprehensive or Differentiated groupings, listed in The Foundation Program's Authorized Courses and Code Numbers, 1986-1988, (ACCN) pages E-11 to E-14. For Grades 11 and 12, additional courses from the Oral Communication, Writing, Literature and Language Study groupings are available. Included in these groupings are:

Comprehensive

English, Phase I, Grade 9
English, Phase II, Grade 10
English, Phase III, Grade 11
English, Phase IV, Grade 12

Differentiated

Advanced Placement in English
Pre-Industrial Preparation Program English I
Pre-Industrial Preparation Program English II
Directed Study in English

Oral Communication

Communication Processes
Group Communication and Leadership

Oral Interpretation
Argumentation and Debate
Advanced Argumentation and Debate
Dramatic Arts, Background and Performance

Writing

Composition Writing
Expository Writing I
Expository Writing II
Creative Writing
Journalistic Writing
Business English

Literature

World Literature
American Literature
British Literature

Language Study

Language Systems
Semantics
Functions of Communication

The Specialized Elective Program which provides a range of courses to meet student needs and interests. Specialized elective courses are listed in the ACCN on pages E-23 to E-25.

To meet the individual needs of special education students, modified non-credit courses in English are provided. Courses which provide special language assistance to students of limited English proficiency are also provided.

The chart below summarizes the course content objectives of selected courses that are reinforced by the following sample activities for integrating exploratory computer literacy into the Language Arts Program. Course content objectives are numbered to correspond to those in the ACCN.

Course Content Objectives	Sample Activities #1	#2	#3	#4
English, Phase I				
2. Understand nature and structure of language.			x	x
3. Understand central idea, theme, purpose or mood of oral and written texts by deducing from data/information given.	x			x
4. Understand and use appropriate conventions, language and organizational patterns in speaking and writing for varied purposes and audiences with emphasis on expressive and infromative in public/formal situations.	x	x	x	x

Course Content Objectives	Sample Activities #1	#2	#3	#4
English, Phase II				
3. Develop inferences, conclusions and hypotheses not explicitly stated in oral and written texts.	x			x
4. Understand and use appropriate conventions, language and organizational patterns in speaking and writing for varied purposes and audiences with emphasis on persuasive in informal situations.	x	x	x	x
English, Phase III				
3. Apply generalizations/concepts gained from oral and written texts to other situations or personal lives.	x		x	
4. Understand and use appropriate conventions, language and organizational patterns in speaking and writing for varied purposes and audiences with emphasis on persuasive in public/formal situations.	x	x	x	x
English, Phase IV				
3. Evaluate ideas and information presented in oral and written texts.	x		x	x
4. Understand and use appropriate conventions, language and organizational patterns in speaking and writing for varied purposes and audiences with emphasis on literary.	x	x	x	x
Pre-Industrial Preparation Program English I Pre-Industrial Preparation Program English II				
1. Develop ability to communicate effectively with others.	x	x	x	x
2. Develop skills in listening effectively.			x	x
3. Develop skills in reading.	x			x
Directed Study in English				
2. Identify an area of study and conduct an in-depth investigation for purpose of completing a project.				x
Communication Processes				
1. Analyze and evaluate conditions affecting an oral communication situation.	x		x	x
4. Interpret feedback in varying oral communication situations.	x		x	x

Course Content Objectives	Sample Activities #1	#2	#3	#4
Group Communication and Leadership				
1. Communicate effectively as a member or leader of a group.	x		x	
2. Develop ability to participate more effectively in discussions.	x			
Argumentation and Debate				
1. Develop skill in preparing, presenting and substantiating sound arguments.	x			x
3. Develop ability to critically analyze messages.	x			
Composition Writing				
1. Write for specific purposes: expressing feelings, giving information, promoting ideas and entertaining.	x		x	x
2. Develop effective organizational patterns, tone and style.		x	x	x
Expository Writing I				
1. Develop understanding of and control over conventions and skills of expository writing.		x		x
2. Develop effective communication of ideas and feelings through careful consideration of subject, audience and purpose.				x
Expository Writing II				
1. Demonstrate competencies in analytical and critical writing.				x
2. Review basic writing skills and gain mastery of these skills through practice.	x	x	x	x
Creative Writing				
1. Develop greater awareness, insight and sensitivity to personal experiences and environment.	x			
2. Express one's perception, insight and feelings in writing.			x	
3. Select from various forms and devices that are available for creative expression through writing.			x	
Business English				
1. Acquire specialized language and styles of business world with emphasis on business letter writing.		x		
3. Know fundamentals of practical English.		x		

Course Content Objectives	Sample Activities #1	#2	#3	#4
American Literature				
5. Understand how writer's handling of setting, plot and characters contributes to aesthetic quality of work.			x	
British Literature				
4. Understand how writer's handling of setting, plot and characters contributes to aesthetic quality of work.			x	
Language Systems				
4. Recognize power of language and ways in which language shapes one's view of world.	x		x	x
Semantics				
3. Develop greater proficiency and control in using language to achieve various purposes.	x	x	x	x
Functions of Communication				
1. Understand various aims and effects of messages, intended and unintended, explicit and implicit.	x	x	x	x

SAMPLE ACTIVITY #1
Uses, Value and Impact of Computers Today

Subject:

Language Arts - Reading/Writing/Oral Communication

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.2.1. Rationalizes information processing
1.2.2. Determines structural components
1.2.3. Sequences process steps
1.2.4. Recognizes computer processes
1.4.2. Operates with words/symbols
2.1.4. Describes problem solving/decision making process
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Topic/Tutor

Prerequisite:

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably.

Classroom Management:

For demonstration purposes,

- One microcomputer system for classroom demonstration (CPU/Keyboard unit, Disk Drive, Monitor);
- One large-screen monitor to use with the microcomputer setup to allow entire class to see results of demonstrations; and
- A large group, instructional easel with felt pens.

A lab setting with two students per computer is recommended.

Materials:

Student texts, workbooks or booklets, such as:

- Be a Computer Literate, by Marion J. Ball and Sylvia Charp, pages 1-4, 46-58; Creative Computing; 1977.*
- Computer Ethics, by Dr. Thomas M. Kemnitz and Philip F. Vincent Trillium Press, Inc.; 1985.*
- Computer Literacy - Programming, Problem Solving, Projects on the Apple, by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, Chapter 9.

- Computer Thinking - New Techbooks, by Patricia A. Relf, pages 74-75; Scholastic, Inc.; 1984.*
- Computers Today, by Donald H. Sanders, Chapter 19.
- People Using Computers, by Don G. Rawitsch; Scott Foresman; 1984.* (A workbook and diskette program)
- Scholastic Computing - An Introduction to Computers, by Jack L. Roberts, Unit 5.

Teacher reference manuals:

- The Apple Computer Clubs Activity Handbook, by Samuel K. Miller and Michael E. Caley, pages 39-46; Prentice Hall; 1984.*
- Computer Literacy, Problem Solving with Computers, by Carin E. Horn and James L. Poirot, pages 44-93.

Teacher-made handout: News Article Analysis Form. (A sample form is provided.)

Time for Activity:

Three to five class periods, depending on the arrangement of hands-on work.

Teacher Preparation:

Select and study materials from the above list. Practice presentation of lessons, collect related news articles and prepare the handout.

Be aware: The People Using Computers program consists of thirteen, program disk lessons which comprise the hands-on, computer lab portion of workbook instruction. These thirteen lessons are contained on three floppy disks, making it impossible for more than three different computer teams to study more than three lessons from this program in one lab session. Because these disks cannot be duplicated, the teacher can only have three of the microcomputers in the lab focus on this program at any one time, unless multiple copies are purchased.

One approach would be to have the workbook-with-computer experience (Part B of every lesson) done in the regular classroom by one student on the demonstration computer. As the one student does this, the entire class learns vicariously by watching his/her hands-on work via the large-screen monitor. Then the three floppy disks can be made available as independent options in both the classroom and the lab for other students who wish to go back to the workbook lessons and learn by actual, hands-on experience.

Sequence of Activities:

1. Have students maintain a journal on the topic of this activity, where all their related written work should be kept. Assign reading material pertaining to the uses and value of computers

*This is an additional teaching resource for computer literacy beyond those listed in the Teacher References section on pages 169-170 in the Grades 9-12 Guide.

today. The exercise on page 75 in the workbook, entitled Computer Thinking - New Techbooks, could be helpful in highlighting the concept that the computer can be a valuable tool in making our lives less tedious and more efficient.

2. Encourage students to bring in and share news articles related to computer uses. Have students research information from the suggested resources and newsclippings on the following categories of computer uses:

   a. Computers for Calculating,
   b. Computers for Individualized Printing,
   c. Computers for Predicting,
   d. Computers for Searching,
   e. Computers for Sorting, and
   f. Computers for Storage.

   Review the skill of paraphrasing, to prevent copying content from resources. Require students to file this information and possible illustrations in their journals within a section titled "Tasks/ Skills that Computers Perform." Discuss the information researched.

3. Have students continue their reading on topics, such as:

   a. Computers in the Aerospace Industry,
   b. Computers in Art,
   c. Computers in Banking and Credit,
   d. Computers in Business,
   e. Computers in Communication,
   f. Computers in Education,
   g. Computers in Engineering,
   h. Computers in Entertainment,
   i. Computers in Law Enforcement,
   j. Computers in Medical Research,
   k. Computers in Medicine,
   l. Computers in Newspapers,
   m. Computers in Pollution Control,
   n. Computers in the Postal System,
   o. Computers in Science,
   p. Computers in Shopping,
   q. Computers in Sports,
   r. Computers in Traffic Control, and
   s. Computers in Transportation.

   Any of the listed resources would be appropriate, especially Be A Computer Literate. Discuss these topics, encouraging student contributions that verify their understanding regarding computer use in various fields of human experience.

   Have students insert their paraphrased information into their journals under a section titled "Areas of Computer Use."

If the workbook and diskette package, entitled People Using Computers, is available, have students cover the lessons given below:

Lesson #3 - "Computer Storage and Accuracy," page 13;
Lesson #4 - "When Speed Counts," pages 17-20; and
Lesson #5 - "Using Computers to Make Decisions," pages 21-24.

Part A of each lesson is best covered in a regular classroom; Part B can be done on the demonstration computer in the classroom or on computers in the lab. Create writing assignments/exercises to reinforce and check the learning done in both environments. Have students file the results in their journals. Give students a short essay exam at the close of this lesson.

4. Summarize in a lecture and discussion the key concepts students should have learned regarding the uses to which computers are presently put. Require students to take notes. Review the basics of good notetaking.

5. Follow up the study on use of computers with the theme of the value and impact of computers in today's society. Require students to bring in news or magazine articles pertaining to the computer's value to and impact on society. Conduct various read/report/discuss sessions in the classroom with the news articles. Numerous articles with a variety of topics allow for multiple, small-group work and reports. Competition can be conducted in tournament fashion, and prizes can be given for groups showing the greatest cooperation and organization in presenting their news reports and personal reactions. Devise a form for article analysis which asks students to evaluate the article in terms of:

   a. Computer Skill,
   b. People Helped,
   c. Results of Help, and
   d. Impact Upon Human Life.

   Distribute and refer to the Handout - News Article Analysis Form.

   Again if available, assign the workbook, People Using Computers, which has seven lessons that will help develop the theme of the computers' impact on society. The lessons are:

   #2 - "How People View Computers," pages 9-12;
   #6 - "Computers Can't Do Everything," pages 25-28;
   #7 - "Computers Are Changing People's Jobs," pages 29-34;
   #8 - "Computers Are Changing How People View Their Jobs," pages 35-38;
   #9 - "Computers Are Changing People's Lives," pages 39-42;
   #10 - "Changing Information In a Computer," pages 43-44; and
   #11 - "Do Computers Make Mistakes?" pages 45-48.

The best way to cover these chapters is first to study Part A in the regular classroom, then to finish up in the lab on the computers, if at all possible. Otherwise, have different students demonstrate Part B of each lesson on the classroom computer.

6. As a final exam/project session, use controversial articles about computers, not yet discussed. The booklet from the list of resources, titled Computer Ethics, (Trillium Press, 1985), as well as the newspaper, are good sources for controversial articles. Read, study and discuss the articles with the class. Analyze the value and impact of the particular computer use. Encourage students to generate many thesis statements related to the topic under study. If need be, review what thesis statements are and how they are developed. Record the thesis statements onto the easel for all to see. Encourage students to discuss each option. Then ask all students to write a short essay of five to eight paragraphs in which one of these thesis statements is developed. Allow adequate class time for this. Review the basics of essay development, as the need arises. Post essays to honor effective, persuasive writers. Encourage these writers to illustrate their work.

NEWS ARTICLE ANALYSIS FORM

Title of Article:
Source:
Date: Author:

Team Members:
Date: Period:

Areas of Analysis-

a. Computer Skill

b. People Helped

c. Results of Help

d. Impact Upon Human Life

SAMPLE ACTIVITY #2
Word Processing Using the PFS Series

Subject:

Language Arts - Writing

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computers
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite:

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably.

Classroom Management:

A lab setting with two students per computer is recommended. For classroom demonstrations there should be one microcomputer with a large monitor. One or two printers should be available.

Materials:

Microcomputers and printers.
Word processor software and manual, such as:
PFS: Write; spelling checker, PFS: Proof; and database file program, PFS: File.
Prepared student diskettes and demo diskette.
Teacher-made handouts for demonstration and exercise: (Samples follow this activity.)

- PFS Series - Reference Notes (Handout #1);
- Sample Letter with Errors (Handout #2);
- Sample Letter with Corrections (Handout #3);
- Story in a Movie Magazine (Handout #4);
- WORDLIST File (Handout #5).

Time for Activity:

Five class periods.

Teacher Preparation:

Become familiar with the software programs and accompanying manuals. Prepare the handouts, the demo diskette, student diskettes with the sample letter file, titled PRACTICE, and the WORDLIST file.

Sequence of Activities:

Lab Session #1 - Using a Spelling Checker and a Word Processor

1. Explain what a word processor is and discuss the advantages over a typewriter. Inform students that they will learn how to revise a letter which has been recorded on their diskettes. Using the classroom microcomputer, introduce and demonstrate the PFS series of programs they shall use: PFS: Proof, a spelling checker, and PFS: Write, a word processor. (PFS: Proof requires a two-drive system). Handout #1 - PFS Series - Reference Notes, which summarizes the major aspects of the word processor to be used on the IBM PC, is a sample of instructions that can be useful. Modifications would be needed for using other machines.

2. Distribute Handout #2 - Sample Letter with Errors, which is the same letter saved on disk and filed as PRACTICE. Have students use PFS: Proof to find spelling errors and type PRACTICE for Document Name. After the computer checks the entire document, have students save the corrected version under a different file name, such as PRACREV1, so both the original and the revised versions are on the same disk. (By putting a number at the end of the file name to match the class period, all classes can use the same diskette but distinguish their revised files.)

3. Referring to Handout #1 for instructions, have students remove the Proof disk, insert the Write disk to correct other errors and request their new file, PRACREV1. For those students whose machines are connected to printers, have them print the corrected letter. All teams should have an opportunity to print their corrected letter. Distribute Handout #3 - Sample Letter with Corrections, and have students compare their printouts with this version of the letter.

Lab Session #2 - Integrating a Word Processor and a Database File

1. Explain that in this session students will learn how to type in their own document using PFS: Write and include information from a database file created with PFS: File. Have students enter the story provided on Handout #4 - Story in a Movie Magazine. They should single space the entire text. Show students how to center the title and explain how the blank lines will be filled in with words from a file called WORDLIST, already prepared by the teacher. Refer to Handout #5 - WORDLIST File. Have students symbolize these words on their document with *item name*. As seen on the handout with the story, the item names are provided. (Both * around each item name must be on the same line.) Have students save their document as STORY1.

2. For printing the story with words merged from the WORDLIST file, students must indicate that they are to use the PFS: File name of WORDLIST. Since each team will have the same story, select one team to print their story and pass it around for all to see. Then show how the WORDLIST file can be revised with new terms, by using the PFS: File program. Allow time for each team to revise this file with appropriate terms of their own choice and save the new version as WRDLST1. Refer to Handout #1 for basic instructions. Have teams merge the terms from WRDLST1 with STORY1. Let teams print their revised story and compare results.

3. As an interesting option, merge all WRDLST1 files, using the COPY Utility in PFS: File, so each team's terms are appended to one master file. With the use of a demonstration microcomputer, show how a form story can be printed in form-letter style, with each copy printing a different set of terms from the master WRDLIST1 file.

PFS: WRITE (1985 version)

Creating/Editing a Document

1. Start from the PFS: WRITE MAIN MENU and select Type/Edit by typing 1 and pressing ENTER.

2. Press the Ins key to switch to the Insert mode and begin typing.

3. Continue typing when you reach the end of a line, since this program will automatically place the next word at the beginning of the next line. (This is called "wordwrap.")

4. Press ENTER when you get to the end of a paragraph; press the Tab key to indent the first word of a paragraph five spaces.

5. Use the arrow keys to move the cursor around in your document without changing your text.

6. Insert characters, spaces, words and lines at any point in your document. Press the Ins key, move the cursor to the place where the inserted text is needed and begin typing. Press ENTER to insert a blank line.

7. Press the Backspace key to erase a character to the left of the cursor, the Shift-F5 key to erase the word the cursor is on or the Shift-F6 key to erase the line of text or blank line the cursor is on.

8. To move a block of text from one location to another, place the cursor at the beginning of the text to be moved. Press the F5 key and move the cursor to the end of the text. Press the Del key and move the cursor to the location desired. Then press the F6 key.

9. To copy a block of text to another location, place the cursor at the beginning of the text to be copied. Press the F5 key then press ENTER to highlight the entire text to be copied and press the F6 key. Move the cursor to the location desired and press the F6 key again.

Saving a Document

1. Return to the MAIN MENU by pressing the Esc key. Select Get/Save/Remove by typing 4 and pressing ENTER.

2. From the GET/SAVE/REMOVE MENU select Save Document by typing 2. Press the Tab key to move the cursor to Directory or Filename. For a two-drive system with the document disk in drive B, type B: before the document name, such as B:LETTER.1 Then press ENTER.

3. For a one-drive system, remove the PFS: Write disk and insert the document disk before proceeding with the GET/SAVE/REMOVE MENU. When finished saving the document, reinsert the PFS: Write program disk.

Printing a Document

1. Turn on the printer, check that it is "on-line" and align the paper properly.

2. From the MAIN MENU select Print by typing 3 and pressing ENTER. The PRINT MENU will then appear.

3. Type in choices for questions if applicable, such as Number of copies and Name of PFS: FILE data file (if this is needed). Press ENTER twice. To stop printing, press the Space Bar.

Retrieving a Document

1. From the MAIN MENU select Get/Save/Remove by typing 4 and pressing ENTER.

2. For a one-drive system, remove the PFS: Write disk and insert the document disk.

3. From the GET/SAVE/REMOVE MENU select Get Document by typing 1. If the document disk is in drive A, press ENTER; if the disk is in drive B, press the Tab key to move the cursor to Directory or Filename. Then type B: and press ENTER.

4. A list of the documents on the disk will appear along with the phrase, "Name of document to get." Type the name of the document you want, such as B:PRACTICE, and press ENTER. For a one-drive system, when a copy of the document has been retrieved and placed in memory, reinsert the PFS: Write program disk.

PFS: PROOF (1985 version)

Using a Spelling Checker (A two-drive system is required.)

1. The PFS: Proof disk should be in drive A. When the PFS: PROOF MAIN MENU appears on the screen, insert the document disk in drive B.

2. From the MAIN MENU select Proof Document by typing 1 and pressing ENTER. For Document Name type in the document desired, such as PRACTICE.

3. After the entire document is checked for spelling errors, PROOFING COMPLETED appears on the screen. Save the document under the same name, unless requested otherwise. Include drive B when typing the name, such as B:PRACTICE or B:PRACREV1.

4. From the MAIN MENU select Exit by typing 3 and pressing ENTER.

PFS: FILE (1985 version)

Creating a File

1. Start from the PFS: FILE MAIN MENU and select Design File by typing 1. Press the Tab key to Filename, type a file name (one to eight characters), such as WORDLIST, and press ENTER.

2. From the DESIGN FILE MENU select Create a New File by typing 1 and pressing ENTER. The blank design screen will appear.

3. In typing the field names, follow these guidelines:

   a. Place a colon at the end of each data item name;
   b. Leave plenty of space for each item;
   c. Make the first item on the form the one to be most commonly used;
   d. The design may have up to 32 pages with as many as 100 items on each page.

4. When finished designing the form, press the F10 key. The file design will be stored on disk and the MAIN MENU will appear on the screen.

Adding, Deleting or Moving Items (A two-drive system is required.)

1. After the MAIN MENU is on the screen, put the data disk on drive A and a formatted disk in drive B. This latter disk can be used for temporary storage while the data file is being redesigned.

2. From the MAIN MENU select Design File by typing 1 and pressing the Tab key to Filename. Type the file name desired or leave it blank for a directory to display a list of files on the disk.

3. After pressing ENTER, the DESIGN FILE MENU will appear. Select Add, Delete or Move Items by typing 2 and pressing ENTER twice.

4. Once the form appears, type the desired changes. Data item names can be:

   a. added by typing the new name in the desired location;
   b. deleted by pressing the Space Bar to space over the name or simply retyping a new name over it;
   c. moved by spacing over the name in its original location and typing it where desired. All data item names must be identical to the item names typed between asterisks in the form document.

5. When finished, press the F10 key.

Changing Existing Item Names

1. Follow procedures 1 and 2 from the previous set of instructions on adding, deleting and moving items.

2. From the DESIGN FILE MENU select Change Existing Item Names by typing 3 and pressing ENTER twice.

3. Retype the data item names as desired, following these guidelines.

   a. Be sure the new data item names leave enough space for all data;
   b. Do not change the order of the items or add or delete items with this option.

4. When finished, press the F10 key.

Adding Data to a File

1. From the MAIN MENU select Add Forms by typing 2 and pressing the Tab key to Filename. Type the name desired. Press ENTER.

2. A blank form will appear. This is the next form that will be added to the file. Press the Tab key to move the cursor to the desired item and type the correct information.

3. Press the F1 key for the Help Screen, which provides information on function keys that can expedite the process of adding data. For instance, the PgUp function key moves to the previous page of a form, such as the only page for the WORDLIST file. Then the F4 key will erase information in all the item names on the current page, so new information can be entered. For WORDLIST, students can insert their own terms for all item names.

4. Press the F10 key to store the changed form, and then press the Esc key to return to the MAIN MENU.

MERGING PFS: WRITE AND PFS: FILE

Merging File Information with Document

1. Follow instructions for Retrieving a Document on page R-31.

2. Return to the MAIN MENU by using the Esc key, and select Print by typing 3 and pressing ENTER.

3. Press the Tab key to move the cursor to name of PFS: File data file. Type the name of the data file having information to be merged into the form document now in memory. For a one-drive system, remove the PFS: Write program disk and insert the document disk. For a two-drive system, if the document disk is in drive B, type B: with the filename to locate the disk drive, such as B:WORDLIST.

4. After pressing ENTER, the Retrieve Spec and Identifier Screens will appear. For now, bypass these screens, using the F10 key. Check to see that the printer is on and the paper properly aligned.

5. Press ENTER to start printing. The file information will be merged into the document.

SAMPLE LETTER WITH ERRORS

Handout #2
Word Processing

October 61, 1986

Mr. and Mrs. Harvey Wellington
11379 Pioneer Drove
Ridgewood, Ca 97706

Deer Mr. and Mrs. Wellington:

Emclosed are the tichets for your charter filght to Maui the first week of december.You will find vowchers for your condomenium and care rental in the folder with the airplain tichets.

I yam also inclosing a brocure and prise list for tors, excurtions and sports, available once you reach the iland. Please let me know, either befora or afta you arive, if you would like to book any of the activities.

Here are some sampple prices:

ScubaDiving	$ 15.00
Volcano Tour	32.50
Two-day Excursion	123.95
Luau/Fire Easter Show	8.50

We hope you will enjoy you're trip to our beautiful iland.

Very truly yours,

Carolyn Jones
Booking Agent

SAMPLE LETTER WITH CORRECTIONS

Handout #3
Word Processing

October 6, 1986

Mr. and Mrs. Harvey Wellington
11379 Pioneer Drive
Ridgewood, CA 97706

Dear Mr. and Mrs. Wellington:

Enclosed are the tickets for your charter flight to Maui the first week of December. You will find vouchers for your condominium and car rental in the folder with the airplane tickets.

I am also enclosing a brochure and price list for tours, excursions and sports, available once you reach the island. Please let me know, either before or after you arrive, if you would like to book any of the activities.

Here are some sample prices:

Scuba Diving	$ 15.00
Volcano Tour	32.50
Two-day Excursion	123.95
Luau/Fire Eater Show	8.50

We hope you will enjoy your trip to our beautiful island.

Very truly yours,

Carolyn Jones
Booking Agent

STORY IN A MOVIE MAGAZINE

Handout #4
Word Processing

You have seen her on the silver _____ playing the part of the
Noun #1

_____ in the movie, "The China _____." Her name is
A profession *Noun #2*

_____ and she is considered to be the most talented
A female celebrity

_____ since _____.
Noun #3 *A celebrity*

Her real name is _____. She was born in
Your full name

_____ and has been an actress since she was 7
A geographical location

years old. Her first part was playing a munchkin in "The _____ of
Noun #4

Oz." She was nominated for an Academy _____ for her work in
Noun #5

"Saturday Night _____."
A disease

When she was 19, she married _____ and they built a
A male celebrity

mansion in exclusive _____. She has dark green _____
A town *Plural noun*

and very _____ hair. Her secret ambition is to go back to
Adjective

college and study to be a/an _____.
Noun #6

(Note: both * around each item name must be on the same line.)

Noun #1: waters

A profession: dog catcher

Noun #2: Dish

A female celebrity: Moozy Cruz

Noun #3: star

A celebrity: Rin Tin Tin

Your full name: Elvira Mopkins

A geographical location: Rocky Ridge

Noun #4: Witches

Noun #5: Toothpick

A disease: pox

A male celebrity: Gabby Dooley

A town: Tinsel Town

Plural noun: ears

Adjective: flowing

Noun #6: elevator operator

SAMPLE ACTIVITY #3
Planning and Writing a Science-Fiction Story

Subject:

Language Arts - Writing/Oral Communication

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computers
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisites:

Language Arts Sample Activity #2 - Word Processing Using the PFS Series (pages R-27 - R-38) or some comparable experience. Students should have some experience with imaginative writing.

Classroom Management:

A lab setting with two students per computer is recommended. Ideally, the whole class should be involved in each lab session. However, if there are only computers enough for half the class, sessions will have to be alternated between both halves, and more time will have to be provided.

Materials:

Microcomputers and printers.
Word processor software and manual, such as:
PFS: Write, Milliken Word Processor, AppleWriter, Paperclip.
Teacher-made handout: Sample Plot Plan. (A copy is provided.)

Time for Activity:

Six to twelve periods, depending on the number of microcomputers available.

Teacher Preparation:

Become familiar with the software program and accompanying manual.
Prepare the handout.

Sequence of Activities:*

Lab Session #1 - Getting Ideas

1. Introduce the science-fiction story as a product of the imagination with such key features as:

   - taking place on another planet;
   - taking place in the future;
   - traveling through time;
   - involving visitors from another planet;
   - involving characters with special unknown tools and gadgets.

   Emphasize that writing a science-fiction story on a computer can not only be fun, but also the computer can help students plan their stories and feel free to create.

2. Have pairs of students load their word-processing program into their microcomputers and open a new file called SFIDEAS. Let them choose one of the following topics or make up their own:

   a. People from Earth travel to another planet. They find this planet is ruled by robots;
   b. A spaceship from another planet lands on Earth. The creatures on this spaceship are a race of highly intelligent bumblebees;
   c. A young man and woman get lost in a blinding snowstorm. After walking for days, they find themselves back in their own town - only the year is 1776.

   Instruct students to type and center their topic at the top of the screen, type all their thoughts about this topic (each one on a separate line), save the file when finished and print out the completed list.

3. Ask students to consider ideas for their characters, setting and main problem before their next lab session.

Lab Session #2 - Beginning the Plot Plan

1. Have the same pairs of students continue their science-fiction writing by opening a new file called SFPLOT. Instruct them to type and center the word BEGINNING at the top of the screen and then the word Characters, underlined and centered, on the line below.

2. Allow time for students to introduce the characters of their stories by listing the main characters across the screen and under each name typing brief information about the person. Distribute the Handout - Sample Plot Plan and have students set the characters and their traits in columns, as seen in the handout.

3. Remind students that a plot plan for any story is divided into three parts: the beginning, the middle and the end. The beginning of any story should describe the characters, the setting and the main problem or conflict. Allow time for students to type the headings for Setting, with Place and Time immediately below, and

Main Problem last; then to list as many details about these headings as possible, referring to the format in the handout.

4. For the Main Problem, point out the need to first list words or phrases that describe the main problem, then words or phrases that tell who, when, where and why in regard to the problem, and finally, combine the information to write a complete statement of the story problem. Have students save the file when finished and print out the beginning portion of their plot plan.

5. Assign students to gather ideas about the middle and ending parts of their plot plan for the next lab session.

Lab Session #3 - Completing the Plot Plan

1. With the same pairs of students continuing their science-fiction writing, remind them to include in the middle of their story how the conflict develops, the turning point and how the conflict is resolved. The ending of their plot plan should tell what happens after the problem is resolved. Have students refer to the same Sample Plot Plan Handout.

2. Have students reopen their SFPLOT file and continue with the format for centering the headings for MIDDLE and ENDING and providing the necessary details. Events should be listed in order of occurrence for the middle portion. For the ending, Characters and Outcome should be listed in matching columns to describe what happens to each of the main characters at the end of the sotry.

3. Allow time for students to create and revise ideas. Have them save their file when finished with the session and print its contents.

4. Ask students to think about the flow of their story as they write it in the next lab session.

Lab Session #4 - Writing the Story

1. Remind students that if they are having trouble writing the beginning of their story, start writing another part; when finished with that, go back and write the beginning. Encourage the use of dialogue and point out the following rules for punctuation:

   - Enclose the exact words of the speaker in quotation marks;
   - Use a comma between the quotation and the speaker tag, if the latter comes before the quotation;
   - Use a comma at the end of the quotation, if the speaker tag follows the quotation; if the quotation ends with any other punctuation mark, use this instead of the comma.

   The following example could be used to illustrate these rules. Have students notice that a new paragraph begins when a new speaker starts talking.

"How did they capture you?" asked Eevyan.

"They knocked me from my oufu," Eleomor replied. "Then they took my shield and my sword."

Eevyan then said, "I am glad I followed you. I can help you escape."

2. Have the same pairs of students open a new file called SFSTORY in which they type and center the title of the story at the top of the screen. Using their plot plan, have them write their story as quickly as they can without worrying about mistakes. If students get "stuck" at a certain part, let then skip that part and finish it later.

3. Allow enough time for students to finish the first draft of their story, save the file and print out a hardcopy.

4. Ask students to study their hardcopy and plan for the revision during the next lab session.

Lab Session #5 - Editing the Story

1. After proofreading their story, have the students reopen their SFSTORY file and revise it by inserting, deleting and changing words, sentences, punctuation and spelling where necessary.

2. Remind students to save their revised file and print out the "final" hardcopy.

Follow-Up Session

1. Have students share their stories in class. Assign both members of each pair a role in the reading or discussion of their product.

2. If appropriate, provide time for a peer critique of each others' stories and an opportunity for further revisions.

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SAMPLE PLOT PLAN

Working on Your Plot Plan

A plot plan is your plan for your story. It is divided into three parts: the beginning, the middle, and the end. Your plan for the beginning of your story should describe the characters, the setting, and the main problem, or conflict. Here is the plot plan for the beginning of a story. Your plot plan should look like this:

BEGINNING

Characters

Oohee	Eevyan	Eleomor
leader of the tribe	Oohee's son	Oohee's daughter
old	ten-years-old	fifteen-years-old
unwilling to try new ways	clever	very smart
long white hair	bright purple hair	bright turquoise hair
white antennae	pink antennae	orange antennae

Setting

Place	Time
the Moon	5380 (Moon Time)
a crater	early period in Moon's history
dark side of the Moon	
lit by lightning bugs kept in jars	
very cold	

Main Problem

need to find a source of heat
the Moonians
in 5380 (Moon Time)
on the dark side of the Moon
in order to survive
The Moonians living on the dark side of the Moon in 5380 (Moon Time) need to find a source of heat in order to survive.

Completing Your Plot Plan

Try to make your plot plan as complete as possible. The more complete you make it, the easier it will be to write your story.

Your plot plan for the middle of your story should tell how the conflict develops. It should also tell its turning point, or how the conflict is resolved. Your plot plan for the end of the story should tell what happens after the problem is solved. Here is a plot plan for the middle and the end of a story. Your plot plan should look like this:

MIDDLE

Oohee tells tribe that their heat source is drying.
Eleomor decides to search for another heat source.
Eleomor travels east to the village of the fierce Mogo Molos.
Eevyan follows her.
Eleomor battles the fierce Mogo Molos.
Eleamor is captured.
Eevyan rescues her.
Together they steal heat source.
They return to their own village.

ENDING

Characters	Outcome
Oohee	steps down as leader of the tribe
Eevyan	becomes chief advisor to new leader
Eleamor	becomes new leader.

Allow your mind time to think about your plot plan after you have completed it. If you come up with more ideas, simple reopen your file and add them to your plan. If you wish to change some details, simply delete the details you wish to change and add the new ones.

SAMPLE ACTIVITY #4
Preparing and Writing a Library Report

Subject:

Language Arts - Reading/Writing/Oral Communication (Coordination with Social Studies is a worthwhile possibility.)

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computers
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisites:

Language Arts Sample Activity #3 - Planning and Writing a Science-Fiction Story (pages R-39 - R-44) or some comparable experience. Students should have some experience with library research. It is recommended that this activity be coordinated between both the Language Arts and Social Studies teachers, if possible. The reading and writing process would involve Language Arts objectives; the topics of research could pertain to Social Studies content; and the research process in gathering information and the communication process of sharing the reports in class can fulfill performance expectations in both areas. If such coordination is not feasible, the topics of research could pertain to research on an author or a literary work.

Classroom Mangement:

Now that students have had experience with working in pairs at the microcomputers on a writing assignment, this activity is best for students working alone on the research and at the computer. Because a computer lab at most can accommodate only half the class - if students are working individually - arrangements must be made for rotating the planning, research and lab times. If this activity is coordinated between the Language Arts and Social Studies teachers, the research and lab times could be shared by both periods.

Materials:

Classroom demonstration microcomputer with a large-screen monitor.
Microcomputers and printers in a lab.
Integrated software that includes a word processor and database or file management, such as Appleworks, PFS: Write, PFS: File, PFS: Report.
Teacher-made handout: Sample Database. (A copy is provided.)

Time for Activity:

Approximately two to two-and-a-half weeks, with other classwork assignments provided, such as reading from the textbook.

Teacher Preparation:

Become familiar with the software package or programs and accompanying manuals. Prepare the handout and demonstration diskette.

Sequence of Activities:*

1. Introduce the database as a useful tool for writing a library report, since it: stores facts on disk that can be arranged in any desired order; helps a student keep track of information; and lets him/her know at a glance how much data he/she has and how much more is still needed. Using a demonstration microcomputer, show how the particular software works for setting up a database with the categories one thinks are important for a topic, such as the Lock Ness monster. Distribute the Sample Database handout, which illustrates a portion of the demonstration diskette. (Refer to the handout following this activity.)

2. Have students select a topic for library research from which a report will be written. Topics can pertain to relevant Social Studies content, such as U.S. Presidents, countries throughout the world, major industries in the highly developed nations versus in the third-world countries, etc. Each student should have a unique topic and be expected to do the assignment independently. Whatever the series of related topics is, take time to discuss with the class important categories to establish in their databases. For example, if U.S. Presidents are to be researched, major categories of information could be: Term of Office, Political Party, Personal Description, Major Events during his Term, Leadership Strengths, Leadership Weaknesses. A sample database format for the U.S. Presidents is provided in the same handout.

3. Inform students of a work schedule, whereby groups are assigned time for planning, research and computer work on a rotational basis, so all can have equal access to the computers and complete their assignment at approximately the same time. The following is a sample work schedule for a class of 30 to 36 students, based on limited computer facilities (10 to 12 machines) and library materials.

Day	Group A	Group B	Group C
1	Initial Planning/Classwork	Initial Planning/Classwork	Initial Planning/Classwork
2	Research	Classwork	Classwork
3	Computer Work	Research	Classwork
4	Report Planning/Classwork	Computer Work	Research
5	Computer Work	Report Planning/Classwork	Computer Work
6	Report Planning/Classwork	Computer Work	Report Planning/Classwork
7	Computer Work	Report Planning/Classwork	Computer Work
8	Classwork	Computer Work	Report Planning/Classwork
9	Classwork	Classwork	Computer Work
10-11	Share Reports	Share Reports	Share Reports
12	Critiques/ Evaluations	Critiques/ Evaluations	Critiques/ Evaluations

More time may be needed for computer lab sessions. If the school's master schedule provided "matching placement" of students from one class into another class, such that period 2 English class remains the same group in period 3 U.S. History, then the above schedule could be alternated between both classes, so less time would be needed for the assignment.

4. During the research time, request students to keep track of their reference sources, so they can enter them on a separate database file as a bibliography. Refer to the Handout - Sample Database for examples of how references may be organized on more than one database file. For the report planning sessions, have students consider as many questions as possible about the who, what, when, where, why and how of their topic. Remind students to create an outline as a skeleton form of their plan for writing. Questions should be placed under the main categories of the topic.

5. During the following lab sessions, have students use a word processor to create a file called PLAN containing this outline of questions with space for answers, which can be found in their database file. A printout of the student's database file is helpful at this time. Encourage the use of placing roman numerals in front of each main category and capital letters in front of the underlying questions. Students may decide in what order to place the main categories and their subsequent list of questions with answers. Have students use arabic numerals in front of the answers to questions and lower case letters in front of further details they wish to add to any answer. When completed, instruct students to save the file and make a hardcopy of it. A sample outline format for a report on the U.S. President series of topics is included in the handout.

6. During class time and as homework, have students prepare a draft of their report, using the hardcopy outline. Remind them to select

the questions and answers most relevant to the main categories of information and use these as the subtopics, each having its own paragraph. Each paragraph needs a main idea supported by facts and examples.

7. Using the word processor, have students create a file called LBREPORT in which they type their library report, based on a draft from their outline for which their database served as the foundation. After they proofread their reports, allow time for final revisions, if necessary. Remind students to include a bibliography page from their database file or files on references. Also, request footnotes, where appropriate. Explain the purpose of footnotes and illustrate how they are inserted. Refer to the handout.

8. Provide time for students to share their reports in class. If appropriate, allow a peer critique of each others' reports and the opprotunity for further revisions.

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Gathering Information for a Library Report

A database is a useful tool for writing a library report. It is a store of information you keep on a disk. In your database, you can store facts as you come across them. Then, when you are ready to plan your report, you can arrange these facts in a useful order and select the ones you will include.

A database also helps you keep track of the information you find. In addition, it shows you at a glance how much information you have and how much you still need to find.

How do you set up a database? First decide on your categories. Then fill in the information you have. Leave empty blanks or question marks to indicate where information is missing. When you find the information, fill in the blanks. The following is part of a database file on the Loch Ness monster.

When sighted	By Whom	Evidence of Sighting
A.D. 565	St. Columba	included report of sighting in his notebooks
1934	Dr. ? Wilson	took photographs of the creature
1963	Richard Fitter	?
?	Clem Skelton	?

Sample Database Format for U.S. Presidents

President:

Personal Description:

Term of Office:

Political Party:

Major Events during his term:

Leadership Strengths:

Leadership Weaknesses:

Sample Outline Format for Report
on the
U.S. President Series of Topics

Abraham Lincoln

I. Personal Description
   A. Who?
      1.
      2.
         a.
         b.

II. Term of Office
   A. When?

III. Political Party
   A. What?
   B. Why?

IV. Major Events during his Term
   A. What?
      1.
         a.
         b.
      2.
         a.
         b.
   B. Why?
      1.
         a.
         b.
      2.
         a.
         b.
   C. When?
      1.
      2.
   D. Where?
      1.
      2.

V. Leadership Strengths
   A. What?
      1.
      2.
      3.
   B. How?
      1.
      2.
      3.

VI. Leadership Weaknesses
   A. What?
      1.
      2.
   B. How?
      1.
      2.

Keeping a Record of Your Reading

To write a good library report, you have to read many books and articles. You can use your computer to help you keep track of the books and articles you read. For example, imagine you are writing a report on the lost continent of Atlantis. You could keep a database file for books that looks like this:

Books

Book	Author	Publisher	Place	Date	Pages
The Mystery of Atlantis	Sherrie Smith	W. H. Smith	New York	1984	1-64
The Lost Continent	Harrold Jones	M. P. Gordon	Boston	1980	1-89

You could keep a database file for magazine articles that looks like this:

Magazine Articles

Article	Author	Magazine	Date	Pages
"Was It There?"	Carl Sherman	Other Worlds	June 1981	16-21
"The Real Atlantis"	Herman Perez	Explorer	October 1983	62-68

Encyclopedia

You could keep a database file for encyclopedia articles that looks like this:

Encyclopedia	Date	Article	Author	Volume	Pages
The New Encyclopedia	1985	"Atlantis"	Teresa Quinn	I	616-617
Encyclopedia Rondo	1985	"Atlantis"	Murray Schulz	II	776-778

Titles of books and magazines are underlined, whereas titles of articles are enclosed in quotation marks.

Writing and Footnoting Your Report

Your library report should be a result of careful research. Therefore, you may choose to write it at a slow and careful pace. After you have finished your first draft, you need to go back and revise it. Then, after you have finished writing your report, you need to read it again to proofread it.

In a library report, you sometimes include quotations from the books and articles you have read. If you use quotations, you need to footnote them. A footnote is a note at the bottom of the page telling where the quotation comes from. Here are two footnotes from a report on the lost continent of Atlantis. Notice that the author comes first in the footnote. Also notice that the footnote tells you the exact page were the quotation can be found.

1. Sherrie Smith, The Mystery of Atlantis, W. H. Smith, New York, 1984, page 4.
2. Herman Perez, "The Real Atlantis," Explorer, October 1983, page 63.

The footnotes are numbered. Each quotation should have a raised number (superscript) to identify which footnote goes with it. Here is an example.

Some people think of Atlantis as a place "of great beauty and high culture."[1]

SAMPLE ACTIVITIES
MATHEMATICS

MATHEMATICS COURSE CONTENT OBJECTIVES

Two credits in Mathematics are required for high school graduation. The overall goals of the Secondary Mathematics Program are to have students:

1. Develop mathematical competence to function effectively in today's society.

2. Develop understanding of the importance and relevance of mathematics historically and in the world today.

3. Develop ability to think critically and to solve problems.

4. Nurture intellectual curiosity and the desire to continue learning.

The Secondary Mathematics Program provides alternative courses and course sequences designed to help prepare students for higher education or career opportunities. Three options are available for the type of courses needed by students and students may move between options. These courses are listed in The Foundation Program's Authorized Courses and Code Numbers 1986-1988, (ACCN) pages F-6 to F-25.

Option X provides courses which are primarily application oriented. Such courses include:

Selected Mathematics Applications - Consumer Awareness (Level A)
Selected Mathematics Applications - Operating a Store (Level A)
Selected Mathematics Applications - Careers (Level A)
Selected Mathematics Applications - Problem Solving Applied to Statistics and Consumer Mathematics (Level A/B)
Selected Mathematics Applications - School Determined (Level A/B)
Business Mathematics (Level A/B)
Consumer Mathematics (Level A/B)
Industrial Mathematics (Level A/B)
Technical Mathematics (Level A/B)
Selected Mathematics Applications - Everyday Activites (Level B)
Selected Mathematics Applications - Home Finances (Level B)
Selected Mathematics Applications - Measurement in the Home (Level B)
Selected Mathematics Applications - Problem Solving Applied to Statistics and the Metric System (Level B)
Pre-Algebra (Level B)
Problem Solving (Level B)

Option Y provides either application or theoretically oriented courses. Such courses include:

Core Algebra (a prerequisite for all other Option Y courses)
Selected Algebra Topics
Core Geometry
Basic Probability
Logic and Reasoning
Investment Mathematics
Statistics

Computer Mathematics
Computer Math Applications

Option Z provides courses which are primarily theoretically oriented. Such courses include:

Algebra IA
Algebra IB
Algebra IIA
Algebra IIB
Algebra III
Geometry A
Geometry B
Trigonometry
Analysis
Analytic Geometry
Calculus (Advanced Placement)
Calculus
Directed Study (Mathematics)

To meet the individual needs of special education students, modified non-credit courses in mathematics are provided.

The chart below summarizes the course content objectives of selected courses that are reinforced by the following sample activities for integrating exploratory computer literacy into the Mathematics Program. Modifications to the activities can make them applicable to other mathematics courses as well. Course content objectives are numbered to correspond to those in the ACCN.

Course Content Objectives	Sample Activities #1	#2	#3	#4
Selected Mathematics Applications Series (Level A)				
1. Develop proficiency in performing the basic arithmetic operations using whole numbers, fractions and decimals in practical situations.	x	x		x
4. Analyze and organize data into tables and simple graphs and to read and interpret charts, maps and graphs.		x		
Business Mathematics (Level A)				
3. Develop basic arithmetic skills as applied to business and finance.		x		
Consumer Mathematics (Level A)				
1. Apply mathematical principles and skills in solving practical consumer problems.		x		
Selected Mathematics Applications (Level B)				
1. Solve ratio, proportion and percent problems.		x		x

Course Content Objectives	Sample Activities #1	#2	#3	#4
Pre-Algebra (Level B) and Problem Solving (Level B)				
1. Develop proficiencies in the areas of numbers and operations, in estimating and measuring and in applying geometric concepts and relationships.	x	x	x	x
4. Develop understanding of symbolism, technical language, conventions and properties of algebra applied to the real number system.			x	x
Business Mathematics (Level B)				
2. Develop proficiencies with simplified versions of business and data-processing systems needed for entry into business careers.		x		
Consumer Mathematics (Level B)				
1. Develop proficiency in applying mathematical principles and skills in solving practical consumer problems.		x		
Core Algebra				
1. Develop the ability to manipulate and evaluate simple algebraic expressions.		x	x	x
2. Develop understanding of the symbolism, technical language and properties of algebra applied to the real number system.			x	x
3. Develop ability to prepare and analyze data tables using algebraic techniques.		x		
6. Develop ability to derive and use formulas from real-world situations.		x	x	x
Basic Probability				
2. Develop skill in determining and in computing with probabilities.				x
3. Develop skill in analyzing and using communications that invoke probabilistic interpretations.				x
Computer Mathematics				
1. Develop proficiency in structuring mathematical systems.	x		x	x
2. Develop ability to solve problems in numerical and non-numerical situations.	x	x	x	x
3. Develop understanding of programming languages.	x		x	x
4. Develop understanding of the structure of computer operations.	x		x	x

Course Content Objectives	Sample Activities #1	#2	#3	#4
Computer Math Applications				
1. Apply problem-solving techniques in numerical and non-numerical situations.	x	x	x	x
2. Effectively use a programming language and programming techniques.	x		x	x
3. Use control structures in writing structured programs.	x		x	x
Algebra IA				
1. Develop understanding of the properties of real numbers.	x		x	x
3. Develop facility with algebraic terminology.			x	x
Algebra IIA				
1. Develop understanding of real numbers.	x		x	x
2. Develop skill in applying the laws of roots and exponents.			x	
4. Develop understanding of relations and functions.			x	x

SAMPLE ACTIVITY #1
Using BASIC to Solve the Magical Mystery of Mathematics

Subject:

Mathematics - Numbers and Operations

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming language
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.3. Develops algorithm for problem solving
4.2.1. Describes how computers assist people

Instructional Mode:

Tutee

Prerequisites:

Entry Level Sample Activity #3 from the Grades 9-12 Guide - Using the INPUT Statement in BASIC (pages 43-46) or some comparable experience and Entry Level Sample Activity #4 from the Grade 9-12 Guide - Using the IF-THEN Statement in BASIC (pages 47-50) or some comparable experience.

Classroom Management:

One microcomputer with a large classroom monitor is needed for demonstration purposes. A computer lab is appropriate for student analysis work.

Material(s):

One microcomputer with a large-screen monitor; demonstration disk.
Chalkboard or overhead projector and screen.
Teacher resource - Computers in Mathematics Education, 1984 Yearbook by National Council of Teachers of Mathematics, pages 172-174.
Teacher-made handouts: (Samples are provided.)

- The Magical Mystery of Mathematics (Handout #1);
- Possible Solution to Magical Mystery (Handout #2).

Time for Activity:

Two to three class periods.

Teacher Preparation:

Study the problem and try out the BASIC program that tests the claim of Mr. Math E. Magic. Prepare the handouts and demonstration disk.

Sequence of Activities:*

1. Distribute Handout #1 - The Magical Mystery of Mathematics and explain that the computer can be used as a tool to help students solve mathematical problems involving computations too tedious and time-consuming to perform by hand or even with a calculator. Have students read the problem. If necessary, discuss what a natural number is.

2. Have students select numbers to test the magician's claim and write the sequence of results on the chalkboard or overhead projector. For example, if the choice is 6, then the sequence of results is: 6, 3, 10, 5, 16, 8, 4, 2, 1.

3. Point out that trying to find a counter-example to the magician's claim would take too much time and could be facilitated by a computer program. Using the demonstration microcomputer, have the class help you develop a simple BASIC program to test the magician's claim. Handout #2 - Possible Solution to Magical Mystery can be distributed to students or available on a demonstration disk.

4. Discuss the contrast of support versus proof for a particular claim and program, such as this one. (The results of the runs provide support for the magician's claim but do not confirm or prove it. Point out that although no mathematician has provided proof for the claim, no one has ever found a counter-example. (Nievergelt, Farrar and Reingold in 1974 report that the magician's claim has been shown to be true for all natural numbers $n \leq 10^{40}$.

5. Have students study the questions on the handout and select two of them to attempt. Working in pairs, provide time for students to explore their selected questions on a microcomputer in the computer lab. Later have students share their findings with the class.

*From Computers in Mathematics Education, National Council of Teachers of Mathematics, pages 172-174; copyright (c) 1984 by NCTM, Inc., Reston, Virginia. Reproduced with permission.

THE MAGICAL MYSTERY OF MATHEMATICS

NAME_____

PERIOD_____

DATE_____

Problems and Questions

Once upon a time, a group of students had the pleasure of attending a performance by Math E. Magic, a mathematically inclined magician. He involved them in several interesting mathematical magic tricks, the final one of which we want to share with you. He asked each member of the audience to choose a natural number and follow these instructions in order.

1. Write the number.
2. If your number is 1, stop.
3. If your number is even, divide it by 2 and then return to instruction 1 and follow through the sequence of steps with this new number.
4. If your number is odd, multiply it by 3, add 1, and then carry out instruction 1 with this new number.

When everyone had finished, he boasted that no matter what number is chosen, his instructions will always produce a 1. No one in the audience could find a counter-example to the magician's claim. Can you?

Questions: Select two questions from the following list to explore.

1. Explain how a computer could be used to prove the magician's claim for all natural numbers less than or equal to 100. Modify the program to produce such a proof.

2. Let us define the length of a sequence as the number of terms in the sequence. The first run of the program produced a sequence of length 7. Can you find two consecutive natural numbers for which the magician's trick will produce sequences of the same length? Can you find three consecutive natural numbers that will yield sequences of the same length.

3. Is there a power of 2 that is most frequently generated first?

4. Explain how a computer might be used to disprove the magician's claim.

5. If the magician's claim were false, we could run into an endless cycle in our program. If you are observing the output as it is being printed, what would be the signal that the program was not going to terminate? Modify the program so that it will automatically terminate if the magician's claim is false.

6. For variety, the magician is considering replacing instruction 4 with the following statement:

   If your number is odd, multiply by 3, subtract 1, and then carry out instruction 1 with this new number.

   Modify the program to test whether the magician will be able to make the same claim if his trick is altered as described.

7. Investigate what would happen if instruction 4 was modified to "Multiply by 5 and add 1" or "Multiply by 5 and subtract 1."

POSSIBLE SOLUTION
TO MAGICAL MYSTERY

Handout #2
Mystery of Mathematics

NAME_____

PERIOD_____

DATE_____

```
010  REM      PROGRAM TO TEST
020  REM      MAGICIAN'S CLAIM
030  REM
040  PRINT "ENTER A NATURAL NUMBER";
050  INPUT N
060  PRINT N;",";
070  IF N = 1 THEN 130
080  IF N/2 = INT(N/2) THEN 110
090  LET N = 3 * N + 1
100  GOTO 060
110  LET N = N/2
120  GOTO 060
130  END

RUN

ENTER A NATURAL NUMBER?10
  10, 5, 15, 8, 4, 2, 1,

ENTER A NATURAL NUMBER?13
  13, 40, 20, 10, 5, 16, 8, 4, 2, 1,

ENTER A NATURAL NUMBER?50
  50, 25, 76, 38, 19, 58, 29, 88, 44, 22, 11, 34, 17, 52, 26, 13,
  40, 20, 10, 5, 16, 8, 4, 2, 1,
```

Sample Activity #2
Practical Problems Using a Spreadsheet

Subject:

Mathematics - Data Display and Analysis

Computer Literacy Student Expectations:

1.1.3. Uses control keys/commands
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.2.4. Recognizes computer processes
1.5.1. Seeks work/play with computer
2.1.4. Describes problem solving/decision making process
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite:

Students should be familiar with the operation of the microcomputer and the various keys on the keyboard.

Classroom Management:

A lab setting with two students at each computer would be ideal; however, groups of three or four are manageable.

Materials:

Microcomputers and printers.
Overhead projector and computer system with a large screen monitor for demonstration purposes.
Spreadsheet program, such as Multiplan or Electronic Spreadsheet.
Teacher-made handouts: (Samples follow this activity.)

- Personal Budget (Handout #1);
- Spreadsheet Problems (Handout #2);
- Spreadsheet Solutions (Handout #3).

Time for Activity:

Two to three class periods.

Teacher Preparation:

Familiarize yourself with the spreadsheet program and manual. Prepare the handouts and demonstration disk.

Sequence of Activities:

1. Begin the sequence of activities by discussing with the students what a spreadsheet is and its usefulness. Clarify and demonstrate with an overhead projector or a large screen monitor the features of the spreadsheet program the students will be using. Point out the rows, columns and necessary commands, such as an alpha sort.

2. Illustrate the advantages of a computerized spreadsheet by first showing on the overhead projector a personal budget projection for the first four months of the coming year. Refer to Handout #1 - Personal Budget. Point out the assumptions provided on the handout upon which the budget model is based.

   Then show the budget and emphasize all the calculations needed to construct the table. Finally, discuss the possibility for changes, such as:

   - What if the initial income is cut to $1400?
   - What if the inflation rate drops to 0.5 percent in March?
   - What if food expenses can be reduced by 10 percent?

   These changes mean tedious recalculations by hand. Emphasize that this is what a computerized spreadsheet is meant to do - to handle efficiently these kinds of calculations and recalculations for changing conditions. Refer to page 2 of Handout #1.

3. Again referring to the Personal Budget Spreadsheet in Handout #1, demonstrate with the classroom microcomputer and large screen monitor the use of the spreadsheet format for this budget. Point out that only a few numbers are entered directly into the spreadsheet. Instead, most of the cells contain algebraic expressions that receive their values from cells they reference. For example, the food expense for March (D6) is the product, +D4*C6, of the current inflation rate (D4) and the food expense for the previous month (C6); April's income (E2) is 10 percent above March's (D2); and the total expense for January (B13) is found by using the built-in function @SUM. As a result, if any one of the entries is changed to reflect a change of the model's hypotheses, the screen display is updated instantly as the value of each cell is recalculated. For instance, if B2 is changed to 1400, the value of B10 becomes 140 and the value of E2 becomes 1540. Finally, in the construction of the spreadsheet, only a few of the expressions need be entered directly. Show how most expressions or formulas can be entered by replicating (or repeating) expressions, a technique that greatly simplifies the construction of a large spreadsheet.

4. Provide time for pairs of students (or teams of three to four students) to select one problem from several problems given on Handout #2 - Spreadsheet Problems, design their spreadsheet format and create the spreadsheet on the computer. Have students share printouts of their spreadsheets with the class and discuss the methods used and/or problems encountered. (Spreadsheet solutions to problems in

Handout #3 - Spreadsheet Solutions are provided at the end of this activity. This sheet can serve as a reference or an optional handout.)

PERSONAL BUDGET

NAME_____

PERIOD_____

DATE_____

Budget Model Assumptions*

- Monthly income will start at $1500 and increase by 10 percent in April.
- The rate of inflation will be 1 percent a month throughout the year.
- A savings account will pay 6 percent interest compounded monthly.
- Food and automobile expenses will vary with the inflation rate.
- Mortgage expense will be constant; insurance payments will vary.
- Some income will be set aside for contributions (10 percent) and investment (5 percent).
- The initial savings-account balance will be $1000; surpluses will go into the account, and deficits will be made up from the account.

Personal Budget Table*

	Jan	Feb	Mar	Apr
Income	1500	1500	1500	1650
Savings Int.	6%	6%	6%	6%
Inflation	1%	1%	1%	1%
Food	400.00	404.00	408.04	412.12
House	400.00	400.00	400.00	400.00
Auto	200.00	202.00	204.02	206.06
Invest	75.00	75.00	75.00	82.50
Contrib.	150.00	150.00	150.00	165.00
Insurance	200.00	0.00	400.00	0.00
Expenses	1424.00	1231.00	1637.06	1265.68
Savings	1080.00	1354.40	1224.11	1614.55

Personal Budget Spreadsheet*
Using VisiCalc

	A	B	C	D	E
1		JAN	FEB	MAR	APR
2	INCOME	1500	+B2	+C2	1.1*D2
3	SAV INT	1.005	+B3	+C3	+D3
4	INFLAT	1.01	+B4	+C4	+D4
5					
6	FOOD	400	+C4*B6	+D4*C6	+E4*D6
7	HOUSE	400	+B7	+C7	+D7
8	AUTO	200	+C4*B8	+D4*C8	+E4*D8
9	INVEST	.05*B2	.05*C2	.05*D2	.05*E2
10	CONTRIB	.1*B2	.1*C2	.1*D2	.1*E2
11	INSURE	200		400	
12					
13	EXP	@SUM(B6...B11)	@SUM(C6...C11)	@SUM(D6...D11)	@SUM(E6...E11)
14	SAVE				
15	1000	+B3*A15+B2-B13	+C3*B15+C2-C13	+D3*C15+D2-D13	+E3*D15+E2-E1

*From Computers in Mathematics Education, National Council of Teachers of Mathematics, pages 184-187; copyright (c) 1984 by NCTM, Inc., Reston, Virginia. Reproduced with permission.

SPREADSHEET PROBLEMS

NAME_____

PERIOD_____

DATE_____

Spreadsheet Practice Problems**

With a partner or two select one problem, design the format and create the spreadsheet on the computer. Be prepared to share printouts of your spreadsheet and discuss the methods used in creating it.

1. Create a spreadsheet to show payments on car loans for loan amounts of $4000, $5000, $6000, $7000 and $8000 on a payment basis of 24 months, 36 months and 40 months. Compare the interest amounts from 9 to 14 percent, using 1 percent increments.

2. a. At the end of the working day the manager at SAV-ON Drugs has the cashiers add up the money in their cash drawers. The cashiers usually make mistakes in counting the total amount of money. A spreadsheet is needed that will allow the employees to enter the number of each kind of coin they have and will then total the cash in their drawer. Mary has 67 pennies, 83 nickels, 40 dimes, 18 quarters, 60 dollars, 8 ten dollars, and 3 twenty dollars. Use your spreadsheet to figure the cash in her drawer.

   b. Now use the same spreadsheet by replacing the numbers to figure the cash in Sam's drawer. Sam has 43 pennies, 72 nickels, 78 dimes, 43 quarters, 30 dollars, 5 ten dollar bills, and 7 twenty dollar bills.

3. a. Mike was doing odd jobs for the people is his neighborhood, and he decided to use his computer to determine the amount of money to charge his customers. He charged $2.00 an hour for babysitting, $5.00 an hour for mowing lawns, $7.00 an hour for raking leaves, $9.00 an hour for washing outside windows, $8.00 an hour for weeding flower beds, and $8.00 for painting. He wants to design a spreadsheet that he can use to enter the number of hours he works on each job and calculate the amount of his earnings. Use the spreadsheet to calculate the amount of each job and the total amount he should charge Mrs. Watson for 2 hours of babysitting, 3 hours of washing windows and 5 hours of raking leaves in one week.

   b. Use the same spreadsheet to figure the pay for Lucille if she babysits for 9 hours, mows lawns for 8 hours and weeds flower beds for 4 hours.

4. a. Lois is trying to plan an automobile trip to Texas. She lives in Houston. Since she can only take off from her job two days at a time, she wants to return to Houston after the visit to each city. She needs to find the driving time from Houston to each city if she is driving 55 MPH - the speed limit. She will use the fomula DISTANCE = RATE X TIME. Since she knows the DISTANCE and the RATE, she will have to divide the DISTANCE by the RATE to find the TIME. She is planning to go to Dallas which is 243 miles away, San Antonio which is 199 miles away, Austin which is 162 miles away, El Paso which is 743 miles away, and Lubbock which is 518 miles away. Create a spreadsheet to find the time to drive to each city. How long will it take her to get to each city?

   b. Lois then decides to drive a little slower and goes 50 miles an hour. Use the same spreadsheet and put in the new speed. How long will it take to drive to each city going this speed?

**From Using Spreadsheets in the Classroom by Jennabeth Bogard and Joan Postma, pages 147-148; copyright (c) 1986 by Addison-Wesley Publishing Co., Menlo Park, California. Reproduced with Permission.

Spreadsheet Solutions to Problems***

1. % & LOAN	24 MO.PYMT	INT	36 MO.PYMT	INT	48 MO.PYMT	INT
9%						
4000	183	386	127	579	100	778
5000	228	482	159	724	124	973
6000	274	578	191	869	149	1167
7000	320	675	223	1014	174	1362
8000	365	771	254	1158	199	1556
10%						
4000	185	430	129	647	101	870
5000	231	538	161	808	127	1087
6000	277	645	194	970	152	1305
7000	323	753	226	1131	178	1522
8000	369	860	258	1293	203	1739
11%						
4000	186	474	131	715	103	963
5000	223	593	164	164	129	1203
6000	280	712	196	1072	155	1444
7000	326	830	229	1250	181	1684
8000	373	949	262	1429	207	1925
12%						
4000	188	519	133	783	105	1056
5000	235	649	166	979	132	1320
6000	282	779	199	1174	158	1584
7000	330	909	233	1370	184	1848
8000	377	1038	266	1566	211	2112
13%						
4000	190	564	135	852	107	1151
5000	238	705	168	1065	134	1439
6000	285	846	202	1278	161	1727
7000	333	987	236	1491	188	2014
8000	380	1128	270	1704	215	2302
14%						
4000	192	609	137	922	109	1247
5000	240	762	171	1152	137	1559
6000	288	914	205	1383	164	1870
7000	336	1066	239	1613	191	2182
8000	384	1218	273	1843	219	2494

2a.

COIN	NUMBER	VALUE
PENNIES	67	.67
NICKELS	83	4.15
DIMES	40	4.00
QUARTERS	18	4.50
$1'S	60	60.00
$10'S	8	80.00
$20'S	3	60.00

TOTAL VALUE 213.32

2b.

COIN	NUMBER	VALUE
PENNIES	43	.43
NICKELS	72	3.60
DIMES	78	7.80
QUARTERS	43	10.75
$1'S	30	30.00
$10'S	5	50.00
$20'S	7	140.00

TOTAL VALUE 242.58

3a.

JOB	RATE	HOURS	AMOUNT
BABYSIT	2.00	2	4.00
MOW LAWNS	5.00	0	0.00
RAKE	7.00	5	35.00
WINDOWS	9.00	3	27.00
WEEDING	8.00	0	0.00
PAINTING	8.00	0	0.00
	TOTAL		66.00

3b.

JOB	RATE	HOURS	AMOUNT
BABYSIT	2.00	9	18.00
MOW LAWNS	5.00	8	40.00
RAKE	7.00	0	0.00
WINDOWS	9.00	0	0.00
WEEDING	8.00	4	32.00
PAINTING	8.00	0	0.00
	TOTAL		90.00

4a.

CITY	DISTANCE	RATE	TIME
DALLAS	243	55	4.42
SAN ANTONIO	199	55	3.62
AUSTIN	162	55	2.95
EL PASO	743	55	13.51
LUBBOCK	518	55	9.42

4b.

CITY	DISTANCE	RATE	TIME
DALLAS	243	50	4.86
SAN ANTONIO	199	50	3.98
AUSTIN	162	50	3.24
EL PASO	743	50	14.86
LUBBOCK	518	50	10.36

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SAMPLE ACTIVITY #3
Using BASIC to Find Prime and Perfect Numbers

Subject:

Mathematics - Numbers and Operations/Algebraic Expressions

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programing language
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.3. Develops algorithm for problem solving
4.2.1. Describes how computers assist people

Instructional Mode:

Tutee

Prerequisite:

Mathematics Sample Activity #1 - Using BASIC to Solve the Magical Mystery of Mathematics (pages R-59 - R-63) or some comparable experience.

Classroom Management:

One microcomputer with a large classroom monitor is needed for demonstration purposes. A computer lab is best for student analysis work.

Materials:

One microcomputer with a large-screen monitor.
Chalkboard or overhead projector and screen.
Teacher resource - The Journal of Computers in Mathematics and Science Teaching by the Association for Computers in Mathematics and Science Teaching, Volume V, Number 1, Fall 1985, pages 30-31, 89-90.
A demonstration diskette with two programs - the Sieve of Eratosthenes and Perfect Numbers, similar to the handouts.
Teacher-made handouts: (Samples are provided.)

Listing in BASIC of Sieve of Eratosthenes (Handout #1);
Listing in BASIC of Perfect Numbers (Handout #2).

Time for Activity:

Two class periods.

Teacher Preparation:

Study Fermat's Formula and try out the BASIC programs that test the Sieve of Eratosthenes and Perfect Numbers. Prepare the handouts and demonstration diskette.

Sequence of Activities:*

Sieve of Eratosthenes

1. Review the concept of prime numbers; ask for examples and counter examples. Discuss the process for finding prime numbers known as the Sieve of Eratosthenes, created by Eratosthenes in 230 B.C. This was an algorithmic approach where all odd numbers starting with 3 are written. The composite numbers in the sequence are then sifted out by crossing off every third number after 3, then from the next remaining number, 5, every fifth number, then from the next remaining number, 7, every seventh number, and so on. In the process some numbers will be crossed off more than once. All the remaining odd numbers along with the number 2, constitute the list of primes.

   Examples of this process are:

   Every third number has been cancelled.
   3 5 7 ~~9~~ 11 13 ~~15~~ 17 19 ~~21~~ 23 25 ~~27~~ . . .

   Every fifth number has been cancelled.
   3 5 7 ~~9~~ 11 13 ~~15~~ 17 19 ~~21~~ 23 ~~25~~ ~~27~~ . . .

2. Refer to the listing in Handout #1 - Sieve of Eratosthenes. Briefly discuss the programming involved. Then demonstrate this program on a microcomputer with a large-screen monitor. Have students suggest input. Point out the value of using a computer to save time and facilitate the application and testing of mathematical theories and formulas.

Fermat's Formula

1. Present Fermat's Formula and explain that in 1636, Fermat, a French mathematician, created a formula for finding prime numbers.

$$f(N) = 2\wedge(2\wedge N) + 1$$

if N = 0	N = 1	N = 2	N = 3
2∧(2∧0)+1	2∧(2∧1)+1	2∧(2∧2)+1	2∧(2∧3)+1
2∧1+1	2∧2+1	2∧4+1	2∧8+1
2 + 1	4 + 1	16 + 1	256 + 1
3	5	17	257

Point out that zero and the first three positive integers will produce primes using Fermat's Formula but not all the primes.

2. Ask students to compare the primes using the Sieve of Eratosthenes and decide if there are infinitely many primes in the form of Fermat's Formula, 2^(2^N)+1. Time should be provided for desk work on a program incorporating this formula and for exploratory work, preferably on computers in a lab.

Perfect Numbers

1. Discuss the concept of perfect numbers. By definition, perfect numbers are numbers the sum of whose proper divisors is equal to the number itself. The first three are:

```
  6 = 1 + 2 + 3
 28 = 1 + 2 + 4 + 7 + 14
496 = 1 + 2 + 4 + 8 + 16 + 31 + 62 + 124 + 248
```

   Only 12 were known by 1952, and as computers become more capable of number crunching more are being found. Today 27 perfect numbers are known. Provide Handout #2 - Perfect Numbers. Go over the listing and demonstrate this program, using the large-screen monitor.

2. As an optional activity, present the connection between the primes and the perfect numbers, such as Euclid's theory:

```
If 2^(N - 1) is a prime
then 2^(N - 1)(2^N - 1) is perfect

Example

     If N = 2

     2^(2-1) = 2^1 = 2 and 2 is prime
     therefore 2^(2-1)(2^2 - 1)
           2^1(4 - 1)
           2 * 3
             6 is a perfect number
```

Notice that the first formula 2^(N - 1) must be checked to see if it is a prime number using one of the methods defined previously. Also, note that the second formula could be checked by another method as well. Give extra credit points to anyone who can create a program in BASIC that tests for Euclid's theory.

*From "Mathematical History the Topic - Computing the Key," The Journal of Computers in Mathematics and Science Teaching, Volume V, Number 1, by Vanessa Huse, page 30; copyright (c) 1985 by The Association for Computers in Mathematics and Science Teaching, Austin, Texas. Reproduced with permission.

SIEVE OF ERATOSTHENES

NAME_____

PERIOD_____

DATE_____

Listing in BASIC**
(Written for Apple IIe)

```
050 REM Eratosthenes Sieve
060 REM
070 REM ****************
080 REM *  Dictionary  *
090 REM ****************
100 REM
110 REM P  - Array containing the prime numbers found so far
120 REM NP - The number of prime numbers found so far
130 REM M  - Number of primes to find
140 REM N  - Number being checked for prime
150 REM X  - Counter
160 REM
170 REM
180 REM ***************************
190 REM *  Initialize Variables  *
200 REM ***************************
210 REM
220 DIM P (5000)
230 P(1)=2
240 NP=1
250 M=0
260 N=2
270 X=1
280 REM
290 REM ***********************************
300 REM *  Print Introductory Material  *
310 REM ***********************************
320 HOME
330 PRINT "                              PRIME NUMBERS"
340 PRINT
350 PRINT "      This program will find the first M prime numbers using
    the Seive of "
360 PRINT  "Erotosthenes.  M must be a postive integer."
370 PRINT
380 PRINT
390 REM ****************************************
400 REM *  Input Number of Primes to be Found  *
410 REM ****************************************
420 INPUT "Number of primes to find";M
```

```
430 IF M<>INT(M) or M<1 THEN PRINT @(5,0),"Number to find must be a
    positive integer!!";CHR$(24):GOTO 420
440 HOME
450 PRINT "The first ";M;" prime numbers are:"
460 IF M=1  THEN  PRINT 1:GOTO 670
470 IF M=2  THEN PRINT 1,2:GOTO 670
480 PRINT 1,2,
490 N=N+1
500 REM ******************************************************
510 REM *  Check to See if Number is Divisible by a Prime  *
520 REM ******************************************************
530 FOR X =1 TO NP
540 IF N/P(X)=INT(N/P(X)) THEN 620
550 NEXT X
560 REM ***********************************************
570 REM *  Print the Prime and Add It to the Array P  *
580 REM ***********************************************
590 PRINT N,
600 NP=NP+1
610 P(NP)=N
620 IF NP+1=M THEN 670
630 GOTO 490
640 REM *****************
650 REM *  End Program  *
660 REM *****************
670 END
```

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NAME_____

PERIOD_____

DATE_____

Listing in BASIC***
(Written for Apple IIe)

```
010 REM PERFECT - A program to determine the type of a number, either
    perfect or not
080 REM ****************
090 REM *  Dictionary  *
100 REM ****************
110 REM N - The number being tested
120 REM S - Sum of the integral factors of N
130 REM X - Counter
140 REM
150 REM ***************************
160 REM *  Initialize Variables  *
170 REM ***************************
180 N=0
190 S=0
200 X=0
210 REM *********************************
220 REM *  Print Introductory Material  *
230 REM *********************************
240 HOME
250 PRINT "                                PERFECT NUMBERS"
260 PRINT
270 PRINT
280 PRINT "     The proper factors of a number are the integral factors of
    that number"
290 PRINT "excluding itself.  If the sum of the proper factors of a
    number is equal to the"
300 PRINT "number, it is said to be perfect.  If the sum is less than
    the number, it is"
310 PRINT "deficient, and, if greater, the number is abundant."
320 PRINT
330 PRINT "     This program will print all of the perfect numbers within
    the numeric"
340 PRINT "range of this computer.  [-32768, 32767]"
350 PRINT
360 PRINT
370 REM ***************************
380 REM *  Loop for Values of N  *
390 REM ***************************
400 N=N+2
```

```
410 REM ************************************
420 REM *  Compute Integral Factors of N   *
430 REM ************************************
440 X=X+1
450 IF X>N/X THEN 490
460 IF N/X<>INT(N/X) THEN 480
470 S=S+X+(N/X)
480 IF X<=N/2 THEN 440
490 REM ***************************************************************
500 REM *  Decide Whether N is Perfect or Not and Print the Result.    *
510 REM ***************************************************************
520 S=S-N
530 IF S=N THEN PRINT N;" is a perfect number."
540 S=0:X=0
550 GOTO 400
```

***From "Mathematical History the Topic - Computing the Key," The Journal of Computers in Mathematics and Science Teaching, Volume V, Number 1, by Vanessa Huse, page 90; copyright (c) 1985 by The Association for Computers in Mathematics and Science Teaching, Austin, Texas. Reproduced with permission.

SAMPLE ACTIVITY #4
Using BASIC for Probability Problems

Subject:

Mathematics - Problem Solving/Probability

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.3. Develops algorithm for problem solving
4.2.1. Describes how computers assist people

Instructional Mode:

Tutee

Prerequisites:

Entry Level Sample Activity #3 from the Grade 9-12 Guide - Using the INPUT Statement in BASIC (pages 43-46) or some comparable experience and Entry Level Sample Activity #4 from the Grade 9-12 Guide - Using the IF-THEN Statement in BASIC (pages 47-50) or some comparable experience.

Classroom Management:

One microcomputer with a large classroom monitor is needed for demonstration purposes. A computer lab is appropriate for student analysis work.

Materials:

One microcomputer with a large-screen monitor.
Chalkboard
Teacher resources:

- Computers in Mathematics Education, 1984 Yearbook by National Council of Teachers of Mathematics, page 166;
- Computer Programming in BASIC by David Myers, Section 7.3, pages 358-368.
- Spotlight on Computer Literacy by Ellen Richman, Chapter 21.

Time for Activity:

Two to three class periods.

Teacher Preparation:

Read the above resources or comparable materials.

Sequence of Activities:

1. Demonstrating with the classroom microcomputer and large-screen monitor, introduce the BASIC function for random number generation appropriate to the type of computer to be used. For the Apple, IBM and Commodore microcomputers, explain the need for the accompanying integer function. The TRS-80 does not need this function for random number generation. Also include the RANDOM statement for TRS-80 or the RANDOMIZE statement for the IBM PC at the beginning of the program to cause a different sequence of numbers to be generated each time the program is run. For the IBM PC three commands will automatically randomize the "seed" requested in the RANDOMIZE statement, based on the seconds in the internal timer, TIME$:

```
X$ = RIGHT$(TIME$,2)
V  = VAL(X$)
RANDOMIZE V
```

   Explain the components of this statement:

```
N = INT(RND(1)*10)+1.
```

2. Use the RND statement to have the computer "roll some dice" and explain the details:

```
10 D = INT(RND(1)*6)+1
20 E = INT(RND(1)*6)+1
30 PRINT "DIE #1 IS"; D
40 PRINT "DIE #2 IS"; E
50 END
```

   Also the tossing of a coin can be simulated:

```
10 C= INT(RND(1)*2)+1
20 IF C = 1 THEN PRINT "HEADS"
30 IF C = 2 THEN PRINT "TAILS"
40 END
```

3. Discuss the meaning of "probability" as it relates to random events, like flipping a coin or rolling dice, and not with events where other factors are involved, such as a football game where skill is a big factor. Illustrate how the probability of an event (p) is the ratio of the number of favored outcomes (f) to the total number of possible outcomes (n): $p = \frac{f}{n}$

   Examples would be:

Getting "Heads" on a coin toss	1/2
Getting "Heads" & "Tails" on one toss with two coins	2/4 = 1/2
Getting a 5 on rolling one die	1/6
Getting an odd # on rolling one die	3/6 = 1/2
Getting two 3's on rolling two dice	2/6 = 1/3

4. Have students write a BASIC program to simulate the toss of a penny, having two persons, X and Y, with five pennies each. Each tosses a coin. If the coins match, X gets both pennies; if they don't, Y gets both. Have the computer show the total number of pennies both X and Y have after each toss. The game ends when one person runs out of pennies.*

   The following sample program explores this problem.

```
100 X=5 : Y=5
105 PRINT X,Y
110 IF RND(0)<.5 THEN X=X+1:Y=Y-1 ELSE X=X-1:Y=Y+1
120 PRINT X,Y
130 IF X=0 OR Y=0 THEN 150
140 GOTO 110
150 END
```

5. As extensions to this problem, have students modify their programs to repeat the entire experiment twenty or even fifty times. Students should also investigate what happens when the starting amounts are not equal. For example, what happens when X starts with three pennies and Y with five? Whoever starts with the smaller number is at a disadvantage. In fact, it can be shown that the probability that X will win all the money is given by $x/(x+y)$. This phenomenon has been known as the "gambler's ruin."

6. Provide time for desk and computer work on this problem and its modifications. Have students demonstrate their programs in class. Point out the advantages of the computer over actually doing the coin tosses. Because the computer can simulate such an experiment much faster, it is possible to get more data very easily (a computer could be left to continue the simulation overnight if necessary), and there will be time to conduct more experiments on variations of the basic problem. This problem demonstrates how the computer can serve as a mathematics laboratory where students use simulation and experimentation to explore important concepts in probability and statistics.

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SAMPLE ACTIVITIES
SCIENCE

SCIENCE COURSE CONTENT OBJECTIVES

Two credits in Science are required for high school graduation. The major specific emphasis of Science Education is toward manipulation of experience gained through interaction with the bio-physical environment. This manipulation is toward generalizations useful for explanation of natural phenomena and the attainment of scientific literacy. Thus, content is seen as important as a source of observation and data to be manipulated, processed and explained.

As a result of science instruction in the elementary and secondary schools, a student should be able to deal with bio-physical phenomena using the following hierarchy of skills and processes:

1. Observe using senses appropriate to the desired data.

2. Classify observations appropriately.

3. Measure accurately.

4. Process data via collecting, recording, organizing and communicating.

5. Evaluate and interpret processed data.

6. Make inferences from interpretations of processed data.

7. Combine the above skills into a personal strategy for experimenting.

The Minimum Elective Program in Science Education in Grades 9-12 provides a variety of laboratory courses to develop these skills listed above and an understanding of the process of science. Such courses include:

Skills in Science
Biology I or Biology BSCS I
Earth Science
Physical Science I or Physical Science IPS
Chemistry or Chemistry (CHEMS)
Physics or Physics (PSSC) or Physics (PP)

The Specialized Elective Program, also emphasizing the development of the listed skills and processes of science, provides alternatives for students with special needs and/or interests. Such courses include:

Science for Self and Society
Environmental Studies, Science
Biology II
Biology BSCS, Special Materials
Biology BSCS II
Environmental Science
Plants and Animals of Hawaii
Zoology S or Zoology Y
Human Physiology S or Human Physiology Y
Advanced Placement Biology
Marine Science

Aerospace I
Aerospace II
Physical Science II or Energy: A Sequel to IPS
Advanced Placement Chemistry
Advanced Placement Physics
Technical Science Y or Technical Science A or Technical Science B
Directed Study (Science)
Seminar in Scientific Research

These courses are listed in The Foundation Program's Authorized Courses and Code Numbers, 1986-1988, (ACCN) pages I-10 to I-31.

In addition, to meet the individual needs of students in special education, adapted and modified courses in science are provided.

The chart below summarizes the course content objectives of selected courses that are reinforced by the following sample activities for integrating exploratory computer literacy into the Science Program. The activities are flexible enough for modification in meeting the course content objectives of these and other courses. Course content objectives are numbered to correspond to those in the ACCN.

Course Content Objectives	Sample Activities #1	#2	#3	#4
Skills in Science				
2. The difference between scientific evidence and personal opinion;	x	x	x	x
3. The tentativeness of scientific knowledge which is subject to change as evidence accumulates;	x	x	x	x
4. That problem-solving and decision-making processes entail change in judgments, attitudes and values;	x	x	x	x
6. The generation of scientific knowledge depends upon the inquiry process and upon conceptual theories.	x		x	x
Biology I or Biology BSCS I				
3. The diversity of life.		x	x	
4. The interrelatedness of all organisms.		x	x	
5. The interdependence of living things with their environments.		x	x	
6. Unifying concepts and principles from the earth sciences.				x
7. Recent developments in the earth sciences.		x		
Physical Science I or Physical Science IPS				
1. The properties and structure of matter.		x	x	x
2. The continuous interactions of energy and matter which accompany changes of matter.		x	x	x

Course Content Objectives	Sample Activities #1	#2	#3	#4
Chemistry or Chemistry (CHEMS)				
2. Recent developments in chemical science.		x		
5. Energy relationships.				x
Physics or Physics (PSSC) or Physics (PP)				
1. Energy transformations in physical phenomena.				x
2. Conservation principles as means of explanation and goals of investigation.				x
3. Fields as models for explanation of interactions of matter and energy.				x
6. Development of an understanding of the use of quantitative relationships for precise descriptions of behaviors of matter and energy.	x			
7. Investigation of the contributions of physics to the activities of humankind.		x		
Science for Self and Society				
1. People can observe, know and understand the universe in which they live.	x	x	x	x
2. Knowledge and information deemed to be scientific are available from various sources and technologies that are accessible and immediately obtainable for personal use.		x		
4. Problem-solving and decision-making processes entail changes in judgments, attitudes and values.	x	x	x	x
5. Science is responsible to society and cannot be set apart from society; interrelationships between science, technology and the other facets of society exist which can be observed, studied and explained.		x		
6. Learning about doing science is an active process; it involves not only increased recall, but also acquiring specific competencies, developing organizing ideas and concepts, increasing perceptivity, and integrating these into personal life.	x	x	x	x
Environmental Studies, Science				
2. Science's contribution to human progress and its influence on social, cultural, ecomonic and biological evolution.		x		
Biology II				
1. Investigation of selected problems in biology through group research or independent study.		x		
2. Exploration of current developments and directions in biological research.		x		

Course Content Objectives	Sample Activities #1	#2	#3	#4
3. Exploration of the social implications of problems and issues in biological science.		x		
Biology BSCS II				
2. Development of a functional understanding of statistical evaluation of data.	x			
3. Development of skill in the use of scientific literature in research.		x		
4. Investigation of the responsibilities of scientists and the role of science in society.		x		
Environmental Science				
4. Current ecological issues and problems.		x		
Advanced Placement Biology				
2. Biological experimentation, instrumentation and analysis of data.	x		x	x
Aerospace I				
1. Exploration of the impact of aerospace activities on world and local climate.		x		
Aerospace II				
2. Orientation to recent developments in aerospace science.		x		
Physical Science II or Energy: A Sequel to IPS				
1. Exploration of the contributions of physical science to human well-being and progress.		x		
Advanced Placement Chemistry				
2. Chemical experimentation, instrumentation and analyses of data.	x		x	x
Advanced Placement Physics				
2. Laboratory experimentation, instrumentation and analyses of data.	x		x	x
Technical Science Y, A or B				
2. Science's relationship to technology and industry.		x		

Course Content Objectives	Sample Activities #1	#2	#3	#4
Directed Study (Science)				
1. Opportunities for in-depth research studies in student-identified areas of interest to include student demonstration of skills in literature search, experimentation and communication.	x	x	x	x
Seminar in Scientific Research				
1. Opportunities for a group of advanced science students, studying under a science teacher, to individually carry out original research in order to exchange results through seminar reports and discussions.			x	
2. Opportunities to further develop and apply scientific inquiry and research skills.				x
3. Developing and/or refining skills needed to use communication systems of the scientific community, including journals, abstracts, symposia, colloquia, papers, alpha-numeric files, etc.		x		

Sample Activity #1
Data Manipulation

Subject:

Science - Statistical Analysis and Probability

Computer Literacy Student Expectations:

1.2.4. Recognizes computer processes
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
2.1.1. Uses computer in decision making
3.3.1. Values efficient information processing

Instructional Mode:

Tool

Prerequisites:

Students should be familiar with Data Arrays in a spreadsheet format and with statistical concepts such as minimum, maximum, range, average, median, and mode.

Classroom Mangement:

One microcomputer should be available for demonstration purposes and at least a small computer lab of two to four microcomputers capable of running the demonstrated software. A full computer lab with two to three students per machine is preferable.

Materials:

Microcomputers; printers.
Any spreadsheet program, such as Multiplan or Electronic Spreadsheet.
Integrated programs such as Lotus 1-2-3 or VP-Planner by Paperback; Software or closely related programs such as the PFS series by Software Publishing, IBM Assistant series or PC-Series by Buttonware will allow combination of data analysis and graphing for future activities.
Teacher-made handouts: (Samples are provided.)

- Sample Class Data (Handout #1);
- Data Manipulation Assignment (Handout #2).

Time for Activity:

Two or three class periods: one for introduction to data manipulation and error avoidance through statistical analysis of large sets of observations; another period for data entry; and possibly a third day for completing and discussing the spreadsheet assignment.

Teacher Preparation:

Read the documentation that comes with the software you plan to use and pretest the program with projected student input. Prepare the needed handouts.

Sequence of Activities:

1. Introduce statistical data analysis as mathematical compensation for randomness of data and reduction of human error effects.

2. Have students perform a large number of statistically random events, such as rolling dice. (Cutting cards will also work, but is difficult to quantify and is subject to greater human error effects.) Collect the data from all teams.

3. Demonstrate the use of a spreadsheet program by entering the class data, using the demonstration microcomputer. Show data manipulation using a spreadsheet sorting routine and available statistical functions. If an integrated program is utilized, demonstrate data transfer to graphing mode in order to produce appropriate bar, pie or line graphs.

4. Have students prepare their own spreadsheets with the class data, using the lab microcomputers. Distribute Handout #1 - Sample Class Data and Handout #2 - Data Manipulation Assignment. When finished, provide time for class discussion. Encourage students to utilize microcomputers for future data analysis.

SAMPLE CLASS DATA

Handout #1
Data Manipulation

Coin Toss Lab

	A	B	C	D	E
1		DATA FROM A COIN TOSS LAB			
2					
3	TEAM	HEADS	TAILS	TRIALS	
4	GEORGE	20	30	50	
5	ROSE	24	26	50	
6	KATHY	28	22	50	
7	ALEX	25	25	50	
8	ANDY	31	19	50	
9	LORI	23	27	50	
10	MALIA	26	24	50	
11	ENRICO	18	32	50	
12	BERT	25	25	50	
13					
14					
15					
16					
17					
18					
19					
20					

DATA MANIPULATION ASSIGNMENT
Using VP-Planner

NAME_____

PERIOD_____

DATE_____

In this lab, you will begin to work in the science of STATISTICS. Statistics are used to reduce the sometimes overwhelming amount of data that scientists collect into more understandable units. You are probably already familiar with at least one statistical term, average. The average, also known as the mean, is calculated by dividing the total of all observed data by the count, or number of observations.

OTHER DEFINITIONS AND ABBREVIATIONS

MINIMUM: MIN The lowest degree or point recorded in a set of data.
MAXIMUM: MAX The highest degree or point recorded in a set of data.
RANGE: R The array of values from the minimum to the maximum in a set of data.
MEDIAN: The middle number in a range of data.
MODE: The number that occurs most often in a set of data.

Use the data from Handout #1 - Sample Class Data in spreadsheet format. Enter the given data on the microcomputer, using the spreadsheet program demonstrated. Then perform the following operations on the data:

SORT Rearrange the data so that the greatest values in column B from Handout #1 are listed in order from the maximum to the minimum. (/A (Arrange),Column B4:B12, Descending <ENTER>)

Add STATISTICS ROWS: Label the maximum and minimum data points and add a row for AVERAGE TOSS OF HEADS AND TAILS at cell A14. At B15, enter the formula for the average heads, @AVERAGE(B4:B12), and also average tails, @AVERAGE(C4:C12) at C15. Note the use of the @ before AVERAGE. This tells the program that a formula is being entered, not text. Add more rows for the maximum and minimum data on heads and tails, using @MAX and @MIN functions. Using these data, calculate the median value.

PRINT Printout the data and statistics.
(/P (Printer) ALL width 80 length 66 P <ENTER>)

SAVE Save you data and formula to disk.
(/S (Save) Enter any legal filename. <ENTER>)

QUIT Leave the Spreadsheet and return to DOS
(/Q (Quit))

On a piece of graph paper, plot the averages in B15 and C15 from Handout #1 on a histogram. This type of graph plots one block for each observation in the data set. The longest bar will give the value of the mode.

Which statistical value gives the most reliable information for this data set?_____ Explain your answer_____

_____

SAMPLE ACTIVITY #2
Scientific Writing

Subject:

Science - Communicating Scientific Data

Computer Literacy Student Expectations:

1.1.4. Selects/Uses written resources
1.1.6. Responds to error messages
1.2.4. Recognizes computer processes
3.3.1. Values efficient information processing
3.3.2. Understands pros/cons of routine tasks
3.3.4. Values communication/information
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite:

Some word processing experience is desirable, such as Entry Level Sample Activity #6 from the Grades 9-12 Guide - Beginning Use of Word Processor (pages 55-58), or Language Arts Sample Activity #2 - Word Processing Using the PFS Series (pages R-27 - R-38).

Classroom Management:

One microcomputer should be available for demonstration purposes and at least a small computer lab of two to four microcomputers capable of running the demonstrated software. A full computer lab with two to three students per machine is preferable.

Material(s):

Microcomputers; printer.
Any word processor, such as Milliken Word Processor, PFS: Write or PC-Write.
Scientific journal, popular science magazines, or local newspaper articles, depending on reading skills of students.
Teacher-made handout: Science Report with Errors. (A copy is provided.)

Time for Activity:

Two class periods: one to introduce the need for scientific communication, differences between data and inference, fact and opinion, science and technology and other related topics and to demonstrate the word processor; and one period for students to use the word processor in a practice session.

Teacher Preparation:

Read the documentation that comes with the software you plan to use and pretest the program with projected student input. Prepare the demonstration disk and handout.

Sequence of Activities:

1. Have students read and write a report on a selected science/technology article from a current reference.

2. Introduce word processing, using the demonstration microcomputer and one of the student papers already entered on disk. Show how word processing is done by typing in the final paragraph of the report. Then edit the report for spelling, punctuation, grammar and spacing errors that were deliberately inserted for the demonstration. Make sure all students can see the large-screen monitor. If a spelling check program is available, show how it can help. Point out its limitations with such words as their versus there.

3. Provide pairs of students or teams of three with a sample report, such as the Handout - Science Report with Errors, to type onto disk as it is and then edit for errors. If a spelling check program is available, have students correct spelling errors using it.

4. Encourage students to sign up for computer time, using a word processor for other science reports.

SCIENCE REPORT WITH ERRORS

Handout
Scientific Writing

TELESCOPES, OTHER PRODUCTS PUSHED AS HALLEY'S COMET FEVER SPREADS

Name of Newspaper_____
Author of Article_____Date of Publication_____

This article is about the approch of Comet /halley, which will be the first appearance since 1910 to viewers with binocalars on th evenings of Fraday and Saturday, November 15 and 61.

The comett has already been seen through telescopesand will become visable to the naked eye by December.

Many people are buying telescopes and binocalars so they can see Halley's on there own. Astronimers recommend obtaining an instrument with the greatest possible aperture.

several books are mentioned for Information.

This article is about technology since it deals with tools that astronomers use. A new vocabulary is: aperture - an opening, hole, gap; the opening or the diameter of the opening in a camera, telescope, etc... through which light passes into the lens.

A question I'd like to know: How can they predict the brightnis of a comet?

SAMPLE ACTIVITY #3
Lab Report

Subject:

Science - Scientific Documentation

Computer Literacy Student Expectations:

1.2.4. Recognizes computer processes
2.1.1. Uses computer in decision making
3.3.1. Values efficient information processing
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Tool

Prerequisites:

Students should have had experience in both word processing and data analysis, such as Science Sample Activity #1 - Data Manipulation (pages R-95 - R-99), and Science Sample Activity #2 - Scientific Writing (pages R-101 - R-103).

Classroom Management:

One microcomputer should be available for demonstration purposes and at least a small computer lab of two to four microcomputers capable of running the demonstrated software. A full computer lab with two to three students per machine is preferable.

Materials:

Microcomputers; printer.
Word Processor, Spreadsheet, Graphing programs, such as the PFS series.
Teacher-made handout: Lab Report - Change in Mass of a Dissolved Salt. (A copy is provided.)

Time for Activity:

Two class periods: one to demonstrate either integration of programs or manual methods of combining text, data and graphics to produce a full lab report; and one period for students to use the software in a practice lab. Any previous student-generated data may be used.

Teacher Preparation:

Read the documentation that comes with the software you plan to use and pretest the program with projected student input. Prepare the handout.

Sequence of Activities:

1. Review software installation, screen handling and keyboarding for text and data.

2. Demonstrate a complete lab report from statement of problem to conclusion with proper graphic representation of data generated. Stress that even though computer programs will often produce any type of graph from any data set, non-continuous data should be represented as a bar graph, not a line graph.

3. Provide time for students to prepare a computer-generated lab report on their most recent experiment. A sample lab report is provided in the Handout - Lab Report - Change in Mass of a Dissolved Salt. This may be used as the demo lab report or as a handout of a good example for students' reference. Encourage students to utilize available computers for all future lab reports.

LAB REPORT
CHANGE IN MASS OF A DISSOLVED SALT

NAME_____

PERIOD_____

DATE_____

PURPOSE: To identify physical changes which might occur as a result of physical and chemical processes, such as dissolving one substance in another.

QUESTION: Does the mass of a system change as the result of mixing or dissolving its component parts?

PREDICTION:_____

MATERIALS: Glass bottle with cap
Salt (NaCl) 2 to 5 g
Water (H_2O) to fill bottle
Balance

PROCEDURE: Fill bottle to mark. Do not put in the salt yet. Place bottle, cap and salt on balance and record the mass of the system.

Add salt to water in bottle and close with the cap. Shake the bottle as necessary to dissolve all of the salt.

Find the mass again of the closed bottle with the dissolved salt and record.

ANALYSIS: Determine the amount of change of mass in the system by subtracting the mass before mixing from the mass after mixing and record. (You may use a formula in your spreadsheet to do this for you.)

Repeat the procedure several times and add statistical values for your data. Add in the class data and obtain class statistics. How does your data compare with the rest of the class?_____

GRAPH: Plot the class data on a histogram to find the frequencies of data points for the class.

Based on your data and the class statistics, what can you determine about the change in mass caused by dissolving one substance in another?_____

_____

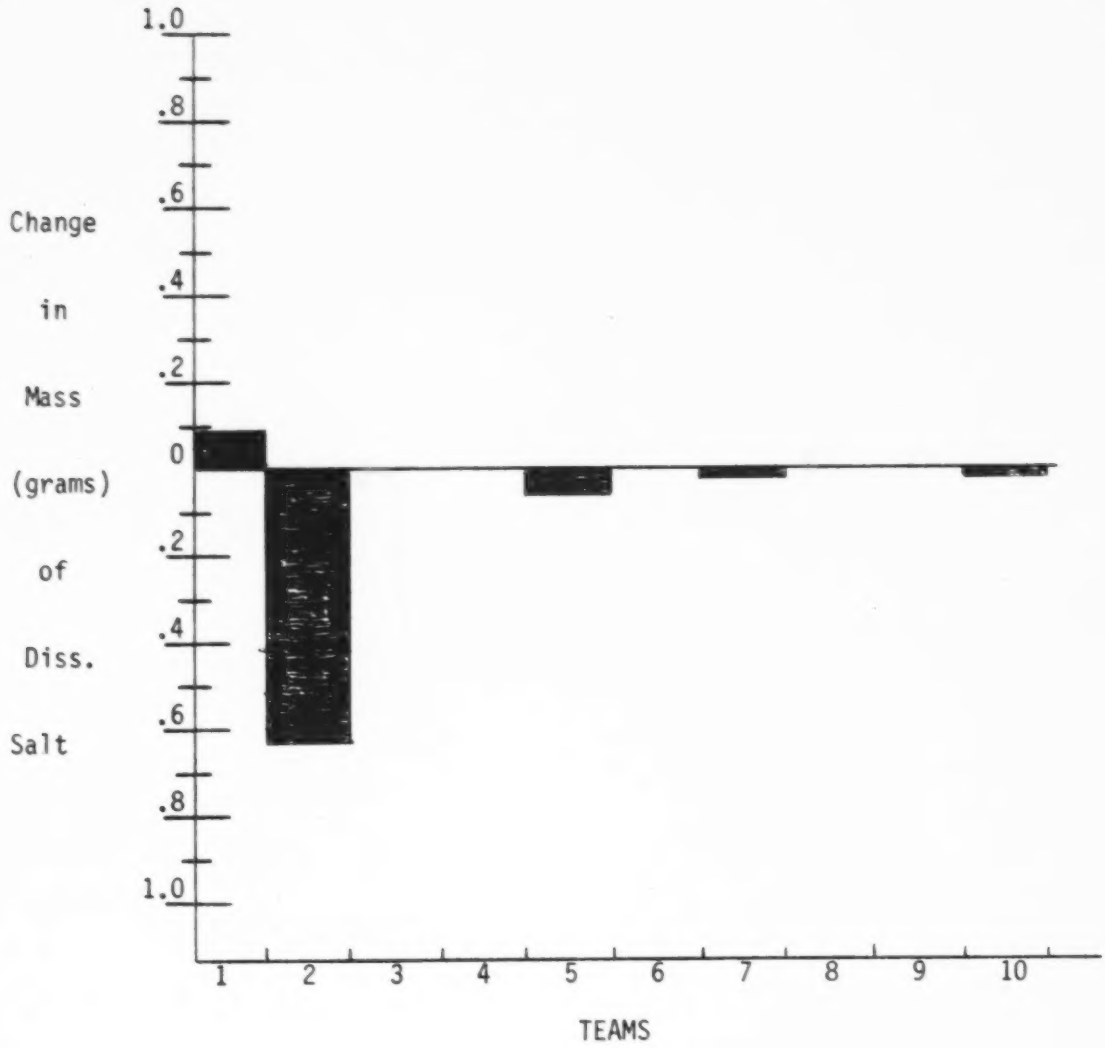
_____

_____

SPREADSHEET

	A	B	C	D
1		DATA MANIPULATION		
2				
3	SAMPLE DATA	CHANGE IN MASS OF A DISSOLVED SALT		
4				
5	TRIAL	MASS BEFORE	MASS AFTER	CHANGE IN
6	#	MIXING (g)	MIXING (g)	MASS (g)
7	1	32.17	32.24	.07
8	2	29.57	28.93	-.64
9	3	28.67	28.67	.00
10	4	36.02	36.02	.00
11	5	27.67	27.64	-.03
12	6	31.55	31.55	.00
13	7	31.45	31.43	-.02
14	8	35.12	35.12	.00
15	9	31.45	31.45	.00
16	10	28.69	28.67	-.02
17				
18		AVERAGE CHANGE		-.06
19		MAXIMUM CHANGE		.07
20		MINIMUM CHANGE		-.64
21		MEDIAN DATA VALUE		-.29

HISTOGRAM
of
CLASS RESULTS



SAMPLE ACTIVITY #4
Temperature Experiments

Subject:

Science - Observations and Measurement

Computer Literacy Student Expectations:

1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
2.1.1. Uses computer in decision making
3.1.1. Identifies input/output peripherals
3.1.2. Describes functions of input, output and processing

Instructional Mode:

Tool

Prerequisite:

Students should be familiar with the operation of the microcomputer. No previous laboratory skills are required, but good lab behavior is mandatory.

Classroom Management:

At least one microcomputer capable of interfacing data collection hardware must be available for demonstration and student use. Three or four microcomputers equipped with sensing devices may be used for lab teams or as different lab stations. In addition to microcomputer-based data collection, students should gather data with traditional measuring tools for comparison and increased reliability.

Materials:

Microcomputers.
Data collecting sensors and attachment hardware, such as Science Toolkit Master Module by Broderbund for Apple. Sophisticated sensors are available for IBM, but Apple software and hardware attached to Quadlink by Quadram is more cost effective and offers compatibility with other Apple software.
Thermometers, graph paper, cups, chemical supplies and trays to contain water spills.
Teacher-made handout: Lab Experiment - Heat of Reaction. (A copy is provided.)

Time for Activity:

Part of one class period to demonstrate data collection hardware and safety precautions for lab use of computers. Two to three periods for class lab experiments.

Teacher Preparation:

Read the documentation that comes with the software you plan to use, set up the data collection hardware and pretest the program with projected student input. Prepare the handout.

Sequence of Activities:

1. Follow directions in the User's Manual and Experiment Guide for the Science Toolkit software package. Any temperature lab within operating parameters of the hardware (-12 to 60 degrees Celsius) will suffice.

2. Distribute the Handout - Lab Experiment - Heat of Reaction, an example experiment. Define the terms, endothermic and exothermic. Clarify the major points of the lab experiment. Demonstrate proper use of the thermistor and techniques to reduce possibility of damage to the computer system. Explain the unit of measurement in the value column of page 3 of the handout.

3. Analyze data for indications of exothermic and endothermic reactions. Data from this activity may be used in a lab report with the assistance of integrated software, including a word processor, spreadsheet and graphing program.

4. Clean and store all hardware which may have come in contact with the chemical solution.

LAB EXPERIMENT
HEAT OF REACTION
Using Science Toolkit
Master Module

NAME_____

PERIOD_____

DATE_____

PURPOSE: Many chemical reactions result in physical changes as well as chemical changes. Some release energy in the form of heat, light, sound or other wave energy. Others take on energy from the environment, and often require external sources of energy to progress.

PROBLEM: Is a reaction of baking soda and calcium chloride endothermic or exothermic?

MATERIALS:
Baking Soda 5g
Calcium chloride 5g
Beaker of Water at room temperature 200ml
Computer with thermal sensor
Graph paper
1 empty beaker 200ml

PROCEDURE: Mix the baking soda and calcium chloride in the empty beaker. Place about 10cc of the mixture in a cup. Measure the temperature of a second cup of water at room temperature. Once the water has reached stable room temperature, add the water to the mixture of chemicals, observe the reaction and measure the temperature continuously, using the strip chart function to produce a time and temperature graph.

Set up the program to record a strip chart over a 24 hour period. This will take data points at approximately 30 second intervals.

Record all of your observations on page 2 of this handout. Science Toolkit Master Module cannot print out the graph, but can print out the data that it collects. You can either copy the graph from the screen or print the data points and draw your own graph. The third page of this handout provides sample data.

WARNING: THE STRIP CHART RECORDS 4000 DATA POINTS, which requires 51 pages of printout. DO NOT PRINT OUT THE FULL ARRAY OF DATA.

DATA: Record all observations and graph the temperature vs. time curve. Using 30 second intervals during the class period.

TIME	TEMPERATURE IN °C	OTHER OBSERVATIONS
00.00		
00.30		
01.00		
01.30		
02.00		

SCIENCE TOOLKIT LOG
INSTRUMENT: Strip Chart
SCALE: Light Level (fc)

POINT	TIME	VALUE
0000	00:00:00	0.9
0001	00:00:00	0.8
0002	00:00:00	0.9
0003	00:00:00	0.8
0004	00:00:00	0.8
0005	00:00:00	0.9
0006	00:00:00	0.8
0007	00:00:00	0.8
0008	00:00:00	0.8
0009	00:00:00	0.8
0010	00:00:00	0.9
0011	00:00:00	0.9
0012	00:00:00	0.9
0013	00:00:00	0.9
0014	00:00:01	0.9
0015	00:00:01	0.9
0016	00:00:01	0.9
0017	00:00:01	0.9
0018	00:00:01	0.9
0019	00:00:01	0.9
0020	00:00:01	0.9
0021	00:00:01	1.0
0022	00:00:01	0.9
0023	00:00:01	1.0
0024	00:00:01	1.0
0025	00:00:01	0.9
0026	00:00:01	1.0
0027	00:00:02	0.9
0028	00:00:02	0.9
0029	00:00:02	0.9
0030	00:00:02	0.8
0031	00:00:02	0.8
0032	00:00:02	0.8
0033	00:00:02	0.8
0034	00:00:02	0.8
0035	00:00:02	0.9
0036	00:00:02	0.9
0037	00:00:02	0.9
0038	00:00:02	1.1
0039	00:00:02	1.3
0040	00:00:03	1.7
0041	00:00:03	2.1
0042	00:00:03	2.3
0043	00:00:03	2.9
0044	00:00:03	3.1
0045	00:00:03	3.3

SAMPLE ACTIVITES
SOCIAL STUDIES

SOCIAL STUDIES COURSE CONTENT OBJECTIVES

Four credits in Social Studies are required for high school graduation. The general objectives of the Secondary Social Studies Program are for students, in increasing depth and scope, to:

1. Identify and use historical and social science knowledge and modes of inquiry in understanding the historical development of people and society.

2. Demonstrate skill in identifying and analyzing issues and problems concerning people and society.

3. Demonstrate the ability to use decision-making and problem-solving processes as related to issues and problems of people and society.

4. Develop attitudes and values based on the use of rational processes in problem solving and decision making.

5. Demonstrate knowledge and understanding that reflect social responsibility to self and others.

For the Basic Program, students in grade 9 must take World History and Culture; students in grade 10 must take United States History and Government; and students in grade 11 and 12 must take one semester of Modern History of Hawaii and three semesters of electives.

Social Studies courses for the high school level are organized into categories of history, social science, and application. These courses are listed in The Foundation Program's Authorized Courses and Code Numbers, 1986-1988, (ACCN) pages J-13 to J-42. Such courses include:

History Courses

World History and Culture
European Studies
Advanced Placement European History
U.S History and Government
Advanced Placement U.S. History
Modern History of Hawaii
History of the Pacific
Hawaiian Studies
Asian Studies

Social Science Courses

Introduction to the Behavioral Science
Anthropology
Sociology
Psychology
Economics
Political Science: Government
Geography

Application Courses

Directed Study
Political Processes
American Problems
Ethnic Studies
Environmental Studies: Social Studies
Global Studies
Marine Studies
Consumer Education
Humanities: Social Studies

In addition, modified non-credit courses are offered to meet the individual needs of special education students.

The chart below summarizes the course content objectives of selected courses that are reinforced by the following sample activities for integrating exploratory computer literacy into the Social Studies Program. The course content objectives are numbered to correspond to those in the ACCN.

Course Content Objectives	Sample Activities #1	#2	#3	#4
World History and Culture				
4. Identify and define the key contributions of the various eras of human progress.	x			
6. Identify and explain the characteristics of today's world as seen through influences from the past.	x			
7. Define social change and explain how it has affected and influenced the lifestyle of people in various cultures.	x			
European Studies				
9. Appreciate the study of the past and accept the value and worth of such study in terms of helping to understand the present and future.	x			
U.S. History and Government				
5. Identify the major schools of interpretation that explain and evaluate the development of the nation.			x	
6. Identify and explain the distinctive features that characterize the American nation today as seen through influences from the past.			x	
Advanced Placement European History Advanced Placement U.S. History				
3. Develop attitudes and patterns of thought consistent with living in a rapidly changing world.			x	

Course Content Objectives	Sample Activities #1	#2	#3	#4
Modern History of Hawaii				
5. Identify and explain the significant social, political and economic issues currently facing Hawaii's people.			x	
History of the Pacific				
3. Appreciate the contributions of the various ethnic groups who comprise the culture of modern Hawaii.	x			
4. Display an awareness of current events in Hawaii and the Pacific through various communications media and discuss them in class.			x	
Asian Studies				
3. Become aware and concerned about problems of economic scarcity and social injustice existing in Asian countries today.			x	
Introduction to the Behavioral Sciences				
1. Identify major ideas and concepts from the disciplines of anthropology, sociology and psychology particularly related to the behavior of individuals and groups: culture, socialization, social classes, social change, self concept, norms, and roles.	x	x		x
3. Use the several modes of inquiry of the disciplines in extending an understanding of human behavior.				x
Anthropology				
1. Identify and define anthropological concepts of culture, variation, social structures, culture/personality, cultural ecology, folklore and the arts.	x			
6. Become aware of the influence of past cultures on our present way of life.	x			
9. Appreciate the anthropological perspective as a means of viewing human behavior.	x			
Sociology				
1. Identify and define sociological concepts of culture, society, socialization, norms, roles, self-concept, social stratification, social class, ethnicity, minority, deviation and social change.		x		x
7. Identify, analyze and propose solutions to social problems.				x

Course Content Objectives	Sample Activities #1	#2	#3	#4
9. Evaluate the role of the individual self in the larger society.		x		x
11. Attempt to improve relations between self and other people.				x
Psychology				
2. Distinguish the behavioral difference between instinct, reflex and learned behavior.		x		
8. Appreciate the broad application of psychology to other disciplines, bahavior modification and industry.		x		
9. Appreciate the application of psychology in understanding human behavior in everyday life.		x		
Economics				
4. Identify various types of economic issues encountered in society by individuals and groups as consumers, producers and citizens.			x	
6. Apply problem-solving and decision-making processes in analyzing economic problems.			x	
Political Science: Government of the United States				
4. Identify and assess the importance of the many factors involved in current problems and the role government plays in the solution of those problems.			x	
7. Be willing to question personal political biases in attempting to analyze public issues.			x	
8. Be willing to discuss public issues.			x	
Geography				
4. Apply learnings from geography in analyzing and evaluating contemporary social and civic problems confronting society.			x	
Directed Study (Social Studies)				
1. Further develop social science inquiry skills through application in a research situation, with the assistance of, or in conjunction with resource people from the professions and the community.				x
Political Processes				
3. Use several modes of inquiry in extending one's knowledge and understanding of political behavior.				x
4. Analyze data and formulate generalizations about political behavior of individuals and groups.			x	

Course Content Objectives	Sample Activities #1	#2	#3	#4
American Problems				
1. Examine current issues and controversies in contemporary society.			x	
2. Use decision-making skills and the problem-solving approach in investigating contemporary issues.			x	
3. Propose alternative solutions, evaluate those solutions, and commit oneself to a course of action.			x	
Ethnic Studies				
5. Identify and analyze problem areas related to ethnic groups.			x	
Environmental Studies: Social Studies				
2. Identify and define specific environmental problems affecting the local and larger environment.			x	
Global Studies				
2. Analyze and evaluate the benefits of modern science and technology in terms of global coorperation.			x	
11. Appreciate the importance of an informed citizenry in the process of foreign policy decision making.			x	
Marine Studies				
3. Analyze the major issues and problems related to coastal and shoreline areas using the problem-solving approach and decision-making process.			x	
Consumer Education				
1. Examine the role of consumer in the marketplace and the effect of the conditions of the marketplace on the consumer.			x	
Humanities: Social Studies				
3. Recognize the modes of inquiry of the social sciences in clarifying value systems.				x

SAMPLE ACTIVITY #1
Using a Database Filing System

Subject:

Social Studies - World History/Anthropology

Computer Literacy Student Expectations:

1.1.3. Uses control keys/commands
1.2.1. Rationalizes information processing
1.2.4. Recognizes computer processes
3.2.1. Identifies applications
5.1.1. Identifies local services/personnel

Instructional Mode:

Tool

Prerequisites:

Students should have had previous experience with loading/booting programs. Students should have basic skills in creating a form on PFS: File or other filing program, and should be able to use data disks, such as in Social Studies Sample Activity #2 from the Grades 9-12 Guide - Developing and Utilizing a Database (pages 107-109).

Classroom Management:

Students, working as part of a group, will use the program diskette to create a file of their discoveries. Students should take turns at entering the data, over the course of several days.

Materials:

Microcomputers with two disk drives each and printers.
Software - PFS: File or similar filing program.
Teacher-made handout: Sample Data Files. (A copy is provided.)
Resources for reference or text, such as:

-Inquiry into Anthropology, by H. L. Abrams, Jr.;
-Invitation to Archeology, by James Deetz, pages 11-19, 23-37.

Time for Acivity:

Approximately one week.

Teacher Preparation:

Become familiar with the software to be used and the accompanying manual. Prepare the handout. Gather the needed artifacts, cardboard boxes and soil for the excavations. Have a student assistant help with setting up the sites.

Sequence of Activities:

1. Prior to going to the computer, students will have had lessons on archeological techniques - mapping, site excavation, dating of artifacts, seriation, stratigraphy, labeling of artifacts.

2. Have students construct miniature archeological sites. They will select a real or make-believe culture and manufacture miniature artifacts that represent occupation of a particular site over a long period of time. Artifacts will consist of tools, weapons, artwork, clothing, structures, cooking fires, etc. Artifacts that represent different time periods will show different styles and will be buried in the site on different levels (cardboard boxes and different types of soil will be used as the sites).

3. Have student groups exchange sites and begin to excavate the artifacts according to techniques covered in previous lessons. Students will map the site, lay out a grid on the site, locate and map basic features such as datum point, and control pit. Artifacts will be excavated, bagged, and labeled according to standard methods.

4. As bags of artifacts from each grid square and each level are accumulated, a student will create a computerized database. Distribute the Handout - Sample Data Files to help students format their database. The database will contain information such as, name of group, site name, site number, map coordinates for the bag being examined, date of excavation, etc. See sample data files. As the number of bags increases, group members will take turns at entering the data.

5. After all artifacts have been recovered from the sites and the database created, ask students to retrieve data from various grid squares on their sites and to describe the artifacts, and explain what kinds of activities were carried on at the site at different times as shown in the levels.

SITE NAME: NILE VALLEY
GROUP: LEAND
:
:
:
:
:
:
STATE(COUNTRY): EYGPT
COUNTY: CAIRO
SITE NO: 3

GRID: E1S3
LEVEL: 2AS

DESCRIPTION: STICK AND BOWL

SITE NAME: NILE VALLEY
GROUP: LEAND
:
:
:
:
:
:
STATE(COUNTRY): EYGPT
COUNTRY: CAIRO
SITE NO: 3

GRID: W1S1
LEVEL: AS

DESCRIPTION: BOWL, PETROGLYPH, AND STICK

SAMPLE ACTIVITY #2
Perceptions

Subject:

Social Studies - Psychology

Computer Literacy Student Expectations:

1.1.2. Reads instructions, keyboard, output
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
3.2.1. Identifies applications
5.1.1. Identifies local services/personnel

Instructional Mode:

Tool

Prerequisites:

Students should have had previous experience with loading/booting programs and preparing handwritten graphs.

Classroom Management:

Students work individually on this activity.

Materials:

Microcomputers with one disk drive each;
Software - Laboratory in Cognition and Perception by Conduit and Easy Graph by Groiler.
Teacher-made handouts: (Copies are provided.)

-Perceptions Response Sheet (Handout #1);
-Perceptions Graph (Handout #2);
-Perceptions Questions to Answer (Handout #3).

Resources for reference or text, such as:

-Invitation to Psychology, by Ragland and Saxon, Chapter 1;

Time for Activity:

A one- to two-week period, depending on the number of computers and software packages available.

Teacher Preparation:

Become familiar with the software to be used and the accompanying manual. Prepare the handouts.

Sequence of Activities:

1. Discuss the factors which influence one's perception of a scene or event: perceptual set, moods, values, attitudes, perceptual principles, etc.

2. Using the Laboratory in Cognition and Perception program, have students run experiment #1 titled "Methods of Constant Stimuli," where they have to compare the lengths of two lines or stimuli based on the Muller-Lyer Illusion. Instruct students to compare the upper line, which is the variable, with the lower line, which is the constant, through 55 trials. Responses from the keyboard should be the "G" key when the variable is greater than the constant, the "L" key when the variable is less than the constant, and the space bar when the two lines are equal in length.

3. After demonstrating practice trials with the program, allow students to run the experiment. Using Handout #1 - Perceptions Response Sheet, have students record their responses, showing a comparison of their responses to the trials. The tally of their responses will be displayed on the screen. (The variable ranges from two to tweleve spaces in length, compared to the constant of seven spaces. Each variable is presented five times during the experiment of fifty-five trials.)

4. After recording their responses, have students continue to the next screen which shows their average response time in hundreths of seconds for each variable. Have students record the average response time on Handout #1 and then graph the results as indicated on Handout #2 - Perceptions Graph. (Easy Graph could be used for the graphing purposes.)

5. Upon completing the graph, have students answer questions, such as on Handout #3 - Perceptions Questions to Answer.

    - When were response times shortest?
      (When the variables were 2-3 spaces or 11-12 spaces?)

    - When were responses the longest?
      (When the variable was nearly the same length as the constant - 6 or 8 spaces - or when it was equal to the constant? Did the response time increase as the differences decreased?)

    Encourage students to discuss other factors which affect their results: attitudes, mood, etc.

PERCEPTIONS RESPONSE SHEET

Handout #1
Perceptions

NAME_____

PERIOD_____

DATE_____

Fill out this response sheet after completing experiment #1 - Method of Constant Stimuli. Your results will be displayed on the screen. Then complete any questions or graphs that are assigned.

SIZE OF VARIABLE STIMULUS	LESS THAN	RESPONSE EQUAL TO	GREATER THAN
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
6	_____	_____	_____
7	_____	_____	_____
8	_____	_____	_____
9	_____	_____	_____
10	_____	_____	_____
11	_____	_____	_____
12	_____	_____	_____

LENGTH OF UPPER LINE	AVE RESPONSE TIME (1/100 SEC)
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____

Remember: The bottom line or constant stimulus is always the same length - seven spaces. The upper line or variable stimulus ranges from two to tweleve spaces in length.

PERCEPTIONS GRAPH

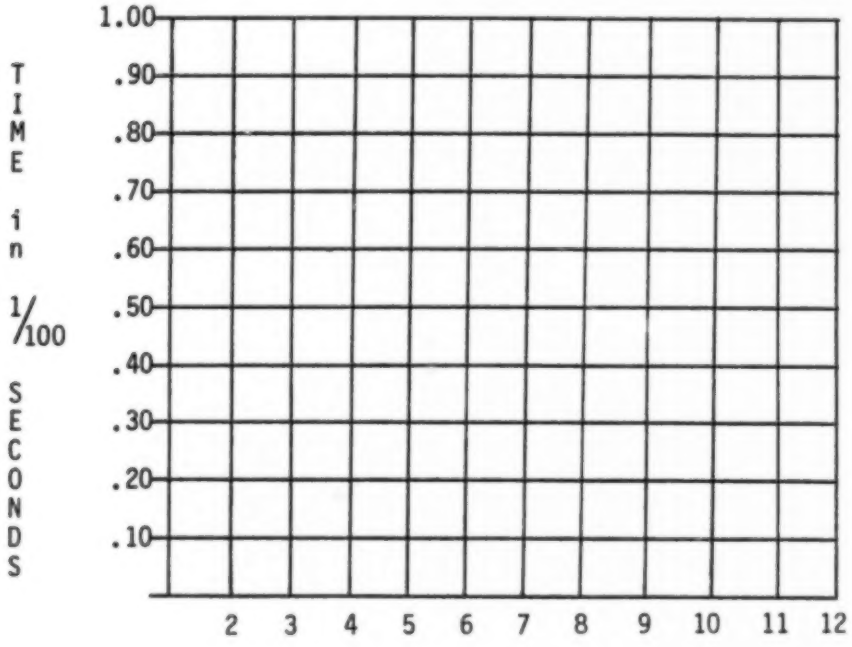
Handout #2
Perceptions

NAME_____

PERIOD_____

DATE_____

PLOT YOUR RESPONSE TIMES USING THE DATA FROM THE RESPONSE SHEET



PERCEPTIONS QUESTIONS TO ANSWER

Handout #3
Perceptions

NAME_____

PERIOD_____

DATE_____

1. What was your longest (slowest) response time?

2. When were your response times the longest (i.e. when the variable stimulus was shorter than or greater than the constant stimulus)?

3. What was your fastest (shortest) response time?

4. Was the variable (upper stimulus) greater than, less than, or equal to the constant (lower stimulus) when you made your fastest responses?

5. When did you have the greatest difficulty in making your responses? Why do you suppose this is so?

SAMPLE ACTIVITY #3
Current Events in Social Studies

Subject:

Social Studies - Current Events

Computer Literacy Student Expectations:

1.1.3. Uses control keys/commands
1.1.5. Experiments as a user
3.2.1. Identifies applications
5.1.2. Identifies national/international careers

Instructional Mode:

Tool/Tutee

Prerequisites:

Students should have had previous experience with loading/booting programs. Students should have some previous knowledge of the elements of news stories, as well as some background in reading and analyzing editorial material in order to recognize bias, distinguishing between fact and opinion.

Classroom Management:

One microcomputer is needed in the classroom for a one to two-week period. If several teachers are interested in this activity, each teacher should have access to the system on a rotational basis. For example, a teacher who has six classes may have exclusive use of the system for 1 to 2 weeks. After that, the next teacher would use the system, and so on until all teachers have used it.

Materials:

Basic Oceanic Cablevision service;
Monthly subscription to special cable news link;
Hardware - Apple IIe with 128k, 80 column display or IBM PC with 256k;
- Printer;
- Decoder box by Oceanic Cablevision;
Software - X PRESS(available only at Computerland)

Description of the X PRESS System:
With the system hooked up to a computer, the school can receive direct feeds of "raw" news from a large number of news sources, including United Press International, Associated Press, various financial sports, national, international and local services. News can be stored and retrieved in a variety of ways. Depending on the computer system being used,"raw" news can be retrieved by using the keyword search function or by category.

Time for Activity:

One to two weeks, with time for computer retrieval, analysis of information, writing and reporting orally.

Teacher Preparation:

Become familiar with the system, putting in several hours of trial usage.

Sequence of Activities:

1. Instruct students on the basic elements of news stories. Provide examples of well-written and poorly-written news articles.

2. Introduce students to the X•PRESS System and how it functions. Assign stories to individual students or to groups, depending on the maturity of the class. Have the class assigned to use the system retrieve the news that has come in overnight on a daily basis. Assigned categories of news stories could be: local, national, Middle East, gold, etc.

3. Have students take the "raw" news from the computer and write their own stories, employing the who, what, where, when, why, and how elements of news story writing. Also assign students to write editorials, being careful to avoid biased statements, glittering generalities, unsubstantiated conclusions, etc.

   News from foreign sources is translated into English by foreign writers in those countries. Encourage students to detect differences in values and attitudes, as reflected in the reporting of foreign journalists.

   As an added bonus, news from Mexico is transmitted in Spanish. "Raw" news from Mexico can be shared with Spanish classes to give those foreign language students additional practice in reading the language they are studying.

4. Have students keep their stories based on the "raw" news that they collected from the computer and compare them to the news as it appears that evening in the local media - television or newspaper. Assign students to look for differences in the way the stories are reported in the local media and hypothesize reasons for discrepancies or differences between the cable source and the published stories. Provide time for class discussions on these concerns.

5. After all classes have had the opportunity to use the X•PRESS system, classes may again use the program. Allow students to collect particular stories or categories of information using the "key word" search capabilities of the system for projects or reports. Eventually any student who is computer literate will be able to use the X•PRESS system to search out and collect stories of particular events, such as, the Philippine elections, the space shuttle disaster, price of gold, the stock market, etc.

SAMPLE ACTIVITY #4
Taking Surveys

Subject:

Social Studies - Psychology/Sociology

Computer Literacy Student Expectations:

1.1.1. Recognizes computer instructions
1.2.1. Rationalizes information processing
1.2.4. Recognizes computer processes
3.2.1. Identifies applications
3.3.6. Identifies applications of computer science

Instructional Mode:

Tool/Tutee

Prerequisite:

Students should have had previous experience with loading/booting programs.

Classroom Management:

This activity is used to assign some students or small groups projects in order to investigate specific topics relating to library reference work. The class should set up a sample survey together, developing a hypothesis and a set of questions to test the hypothesis.

Materials:

Hardware - Apple IIe with 64k, 1 disk drive
- Monitor, Printer
Software - Survey Taker by Scholastic
- Data diskette
Teacher-made handout: School Attitudes Survey. (A copy is provided.)

Time for Activity:

Two to four weeks, allowing time for regular course work and time for preparing reports and presenting them orally.

Teacher Preparation:

Become familiar with software and accompanying manual. Prepare the handout.

Sequence of Activities:

1. Assign each student or pair of students to do a research project and report requiring a survey. Provide students with a list of suitable topics from which to choose.

2. Encourage students to do their own gathering of data to test any hypothesis they have formulated for the project. Have them develop survey questions to sample the attitudes of faculty, classmates, and underclassmen on their topics.

   Students could develop a list of questions to sample student attitudes, based on their assumption that: most students feel good about school and consider themselves prepared for adult life, as a result of high school experiences. Some of the questions could be:

   - Should school attendance be mandatory?
   - Do you enjoy school?
   - Do you feel safe in school?
   - Should schools bring back corporal punishment?
   - Do you feel that school has prepared you for adulthood?

   Questions can be either multiple choice or "yes"-"no." A list of survey questions should be entered onto a Survey Taker data disk and printed out on a hardcopy. An example of survey questions is provided in the Handout - School Attitudes Survey. It can be used for student reference or as the basis for a project.

3. After students decide on their project topic, have them formulate a hypothesis and prepare their survey questions. Have students distribute their survey to the target group, collect and tabulate the results of the survey. Raw data from each response sheet will be entered into the computer. Survey Taker will tally all responses and make tables and graphs for each question.

4. Have students take the results and analyze the data to determine whether or not the data confirms their original hypothesis. Encourage students to revise their hypothesis, if it cannot be confirmed by the evidence.

5. Finally, provide time for students to present their findings in a written report to be given orally, which explains the process they followed in reaching their conclusions and includes some reference material from library resources that offers background information on the topic.

SCHOOL ATTITUDES SURVEY

Handout
Survey

Question: 1

SHOULD SCHOOL ATTENDANCE BE REQUIRED UP TO AGE 18?

Answers:

A YES
B NO

Question: 2

DO YOU ENJOY SCHOOL?

Answers:

A YES
B NO

Question: 3

DO YOU FEEL SAFE AND SECURE IN SCHOOL?

Answers:

A YES
B NO

Question: 4

DO YOU STUDY AT LEAST 2 HOURS EVERY NIGHT?

Answers:

A YES
B NO

Question: 5

SHOULD SCHOOLS BRING BACK CORPORAL PUNISHMENT?

Answers:

A YES
B NO

Question: 6

DO YOU FEEL THAT SCHOOL HAS PREPARED YOU FOR ADULT LIFE?

Answers:

A YES
B NO

Question: 8

IF GIVEN THE CHOICE, WOULD YOU DROP OUT OF SCHOOL?

Answers:

A YES
B NO

RESOURCES
RECOMMENDED SOFTWARE
and
ADDITIONAL TEACHING AIDS

EXPLORATORY COMPUTER LITERACY RECOMMENDED SOFTWARE
High School Level

Title	Grade(s)	Hardware	Use	Cost	Publisher
Apple Presents Apple	4-12	APP	Introduction to Computer	none	APP
AppleWorks	7-12	APP	Integrated Spd, WdPr, DB	$250.00	APP
AppleWriter	7-12	APP	Word Processing	$149.95	APP
Bank Street Writer, Speller	4-12	APP, IBM, C64	Word Processing	$70-$95	SCH
Chipwits	7-12	APP	Programming/Problem Solv.	$ 39.95	BRP
Classification	4-9	APP, IBM	Problem Solving	$ 36.00	MEC
Computer Discovery: A Comp. Lit. Prog.	7-12	APP, IBM, TRS	Computer Literacy	$200.00	SRA
Cut & Paste	4-12	APP, C64	Word Processing	$ 50.00	ELA
Earth & Life Science (Sci. Vol. 3)	7-12	APP	Problem Solving	$ 39.00	MEC
Enchanter	6-12	APP, IBM	Problem Solving, Game	$ 39.95	INF
Easy Graph	4-9	APP, IBM, C64	Graphing	$ 49.95	GRO
Electronic Spreadsheet	7-12	APP, IBM	Spreadsheet	$ 49.00	MEC
Experiencing Procedures	6-9	APP, IBM	Pre-Programming	$ 36.00	MEC
Flight Simulator	7-12	IBM	Simulation	$ 34.50	MCP
Friendly Filer	4-9	APP, IBM	Data Base	$ 39.95	GRO
Fun House Maze: Strats. in Prob. Solv.	4-12	APP	Problem Solving, Game	$ 59.00	SUN
Gears	7-12	APP, IBM	Problem Solving	$ 59.00	SUN
Gertrude's Puzzles	3-9	APP	Problem Solving, Game	$ 44.95	TLC
Homeword	4-12	APP	Word Processing	$ 69.95	SOL
IBM Assistant Series - special rate for the package of 5 programs	9-12	IBM	Integrated Write, File, Report, Plan, Graph	$462.50	IBM
In Search of the Most Amazing Things	4-9	APP, IBM, C64	Problem Solving, Game	$ 39.95	SSC
King's Rule: Mathematics & Discovery	6-12	APP, IBM, C64, TRS	Problem Solving	$ 59.00	SUN
Know Your Apple	2-12	APP	Keyboard Familiarity	$ 39.95	MSE
KoalaPad Touch Tablet	K-12	APP, IBM	Graphics	$149.95	KOA
Laboratory in Cognition & Perception	7-12	APP	Problem Solving/Psych	$140.00	CON
Logo Programs	K-12	IBM	Programming	$125.00	IBM
Logo Programs	K-12	APP	Programming	$80-$150	APP
Loops	6-9	APP, IBM	BASIC Programming	$ 36.00	MEC

Title	Grade(s)	Hardware	Use	Cost	Publisher
Lotus 1-2-3, Version 1A	7-12	IBM	Integrated Spd, WdPr, DB	$ 99.00	LOT
MasterType	2-12	APP, IBM	Keyboarding	$ 39.95	K12
Magic Slate	4-12	APP	Word Processing	$ 65.00	SUN
Milliken Word Processor	3-12	APP	Word Processing	$ 69.95	MIL
Mind Prober	7-12	APP, IBM	Problem Solving/Psych	$ 49.95	HES
Mind Puzzles	6-9	APP	Problem Solving	$ 49.00	MEC
Modeling	4-9	APP, IBM	Problem Solving	$ 36.00	MEC
Moptown Hotel	4-12	APP	Problem Solving	$ 39.95	TLC
Multiplan	7-12	APP, IBM, C64	Spreadsheet	$95-$195	MCP
PaperClip - Professional Word Processor	7-12	APP, IBM, C64	Word Processing	$ 59.95	BIN
PC Calc	5-12	IBM	Spreadsheet	$ 59.95	BUT
PC Paint Plus	4-12	IBM	Graphics	$ 99.00	MSY
PC-Write	7-12	IBM	Word Processing	$ 75.00	QKS
PFS: FILE	7-12	APP, IBM, C64, TRS	Data Manager	$125.00	SPC
PFS: GRAPH	7-12	APP, IBM, C64, TRS	Graph Generator	$140 00	SPC
PFS: PROOF	7-12	IBM	Spelling Checker	$ 80.95	SPC
PFS: REPORT	7-12	APP, IBM, C64, TRS	Report Generator	$125.00	SPC
PFS: WRITE	7-12	APP, IBM	Word Processing	$140.00	SPC
Print Master	4-12	IBM	Graphics	$ 59.95	UME
Problem Solving Strategies	4-9	APP	Problem Solving	$ 48.00	TLC
Processing Words	6-9	APP, IBM	Word Processing	$ 36.00	MEC
Puzzles and Posters	1-12	APP, IBM, C64, TRS	Practice Tool	$ 59.00	MEC
Robot Probe	3-12	TRS	Problem Solving	$ 49.00	SUN
Rocky's Boots	3-12	APP	Logic	$ 49.95	TLC
Science Toolkit - Master Module	4-12	APP	Microcomputer-Based Lab	$ 59.95	BRO
Snooper Troops Series	4-12	APP, IBM	Game	$ 44.95	SSC
Summer Games	6-12	APP, C64	Problem Solving, Games	$ 40.00	EPY
Story Tree	4-12	APP, IBM	Language Arts	$ 59.95	SCH
Survey Taker	3-12	APP	Data Organizer	$ 37.50	SCH
Survival Math	6-12	APP, IBM, TRS	Simulation	$ 49.00	SUN
Superscripsit	4-12	TRS	Word Processing	$199.00	RAD
Teasers by Tobbs	4-12	APP, IBM	Problem Solving, Games	$ 49.00	SUN

Title	Grade(s)	Hardware	Use	Cost	Publisher
The Factory	3-12	APP	Problem Solving	$ 49.00	SUN
The Glass Computer	6-9	APP, IBM	BASIC Programming	$ 36.00	MEC
The Incredible Laboratory	3-12	APP	Problem Solving	$ 49.00	SUN
The Newsroom	6-12	APP, IBM	Journalism	$ 49.95	SPB
The Pond	3-12	APP, IBM	Problem Solving	$ 49.00	SUN
The Print Shop	4-12	APP, C64	Graphics	$ 49.95	BRO
The Right Turn	7-12	APP, C64	Problem solving, Games	$ 59.00	SUN
VP Planner	7-12	IBM	Integrated Spd, DB	$ 99.95	PBS
WordProof	4-12	IBM	Word Processing	$ 60.00	IBM
X•PRESS	9-12	APP, IBM	Communications Package	$ 50.00	XIS
Zork I	6-12	APP, IBM	Problem Solving Game	$ 39.95	INF

PUBLISHER CODES

CODE	PUBLISHER	ADDRESS	CITY, STATE	ZIP
APP	APPLE COMPUTER, INC.	10260 BANDLEY DR.	CUPERTINO, CA	94017
BER	BERTAMAX (EISI)	3647 STONEWAY NORTH	SEATTLE, WA	98103
BIN	BATTERIES INCLUDED	17875 SKY PARK NORTH #P	IRVINE, CA	92714
BRO	BRODERBUND SOFTWARE	17 PAUL DR.	SAN RAFAEL, CA	94903
BRP	BRAINPOWER, INC.	24009 VENTURA BLVD. 250	CALABASAS, CA	91302
BUT	BUTTONWARE	P.O. BOX 5786	BELLEVUE,WA	98006
CON	CONDUIT SOFTWARE	UN. IOWA/OAKDALE	IOWA CITY, IA	52242
CSI	COUNTERPOINT SOFTWARE	4005 W. 65th ST. 3218	EDINA, MN	55435
ELA	ELECTRONIC ARTS	2755 CAMPUS DR.	SAN MATIO, CA	94403
EPY	EPYX COMPUTER SOFTWARE	1043 KIEL CT.	SUNNYVILLE, CA	94089
EWS	EDU-WARE SERVICES, INC.	22035 BURBANK BLV. 223	WOODLAND HILLS, CA	91368
GRO	GROLIER ELC. PUBL.	95 MADISON AVE. # 407	NEW YORK, NY	10016
HES	HUMAN EDGE SOFTWARE	2445 FABER PL.	PALO ALTO, CA	94303
IBM	IBM CORP.	P.O. BOX 1328-S	BOCA RATON, FL	33432
INF	INFOCOM SOFTWARE	125 CAMBRIDGE PARK DR.	CAMBRIDGE, MA	02140
LOA	KOALA TECHNOLOGY CORP.	3100 PATRICK HENRY DR.	SANTA CLARA, CA	95052
LOT	LOTUS DEVELOPMENT CORP.	161 FIRST ST.	CAMBRIDGE, MA	02142
K12	K-12 MICROMEDIA	172 BROADWAY	WOODCLIFF LAKE, NJ	07675
MCP	MICROSOFT CONSUMER PROD.	10700 NORTHRUP WAY	BELLEVUE, WA	98004
MEC	MECC	3490 LEXINGTON AVE. N.	ST. PAUL, MN	55112
MIL	MILLIKIN PUBLISHING CO.	1100 RESEARCH BLVD.	ST. LOUIS, MO	63121
MSE	MUSE SOFTWARE	330 NO. CHARLES ST.	BALTIMORE, MD	21201
MSY	MOUSE SYSTEMS	2336H WALSH AVE.	SANTA CLARA, CA	95051
PBS	PAPERBACK SOFTWARE, INC.	2612 EIGHTH ST.	BERKELEY, CA	94710
PCS	PC SOFTWARE	4155 CLEVELAND AVE.	SAN DIEGO, CA	92103
QKS	QUICKSOFT	219 FIRST N. #224	SEATTLE, WA	98109
RAD	RADIO SHACK	1400 ONE TANDY CENTER	FORT WORTH, TX	76102
SCH	SCHOLASTIC, INC.	P.O. BOX 7502	JEFFERSON CITY, MO	65102
SOL	SIERRA ON-LINE, INC.	SIERRA ON-LINE BLDG.	COARSEGOLD, CA	93614
SPC	SOFTWARE PUBLISH. CORP.	1901 LANDINGS DR.	MOUNTAIN VIEW, CA	94943
SRA	SCIENCE RESEARCH ASS. INC.	155 N. WACKER DR.	CHICAGO, IL	60606
SRB	SPRINGBOARD SOFTWARE, INC.	7807 CREEKRIDGE CIRCLE	MINNEAPOLIS, MN	55345
SSC	SPINNAKER SOFTWARE	215 FIRST STREET	CAMBRIDGE, MA	02142
SUN	SUNBURST COMMUNICATIONS	39 WASHINGTON AVE.	PLEASANTVILLE, NY	10570
SWP	SOUTH WESTERN PUB. CO.	5101 MADISON RD.	CINCINNATI, OH	45227
TLC	THE LEARNING COMPANY	545 MIDDLEFIELD RD. 170	MENLO PARK, CA	94025
UME	UNISON MEDIA	2150 SHATTUCK AVE.	BERKLEY, CA	94704
XER	XEROX EDUCATION PUBL.	245 LONG HILL RD.	MIDDLETOWN, CT	06457
XIS	X•PRESS INFORMATION SERVICE	1536 COLE BLVD. BLDG #4	GOLDEN, CO	80401

ADDITIONAL TEACHING AIDS

Available at the TECHNICAL ASSISTANCE CENTER
3645 Waialae Avenue, Room B-6
Honolulu, HI 96816
PH: 735-2825

COMPUTER KEYBOARDS AND CHARTS

Apple IIe Keyboard	37" x 11"
Apple IIe Keyboard	8½" x 13"
Commodore 64 Keyboard	31" x 13"
Commodore 64 Keyboard	18" x 14"
IBM-PC Keyboard	10" x 38"
IBM-PC Keyboard	8½" x 11"
Radio Shack TRS-80 Model 4 Keyboard (with key pad)	38" x 12"
TRS-80 Color Computer 1 & 2 Keyboard (without key pad)	14" x 18"
IBM Selectric Typewriter Keyboard	29½" x 11"
Special Keys: Apple IIe Chart	23½" x 14"
Special Keys: IBM-PC Chart	14" x 23½"
Computer Finger Chart	8½" x 13"
Care and Handling of Diskette Chart	18" x 12"
Computer Etiquette Chart	18" x 12"
Computer System Components and Functions Chart	18" x 12"

Note: The Apple and Commodore Keyboards are screenprinted on heavy Crescent boards. All others are printed or Xeroxed on white paper. Subject to availability.

Oahu requesters: Call if items are available for pick up.
Neighbor Island requesters: Contact your district liaison for TAC.

TEACHING KIT

The Flip Side of Floppies, A Basic Introduction to Computers and Floppy Disks Featuring Robot Tutor Viktor Verbatim by Verbatim Corporation. (Includes a ten-minute, color videotape and teaching guide)

Call TAC librarian, at 735-2825 to reserve teaching kit.